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LAND AIR WATER

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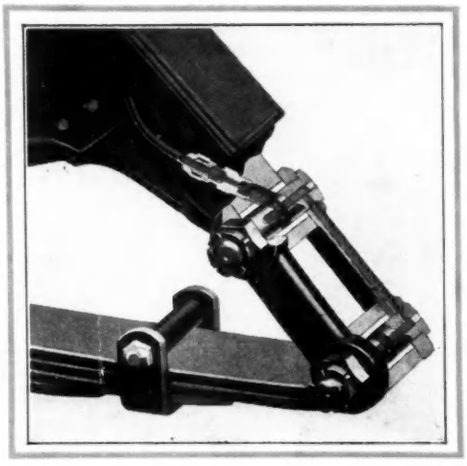
The

NEW BIJUR SYSTEM OF

AUTOMATIC

CHASSIS LUBRICATION



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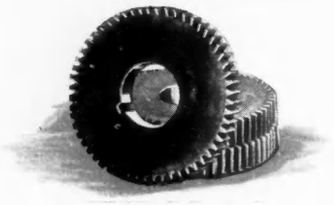
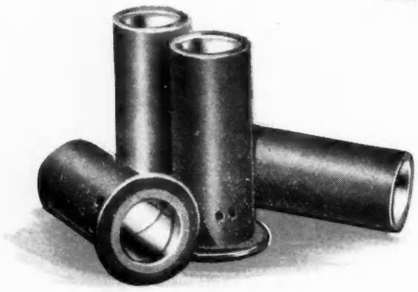
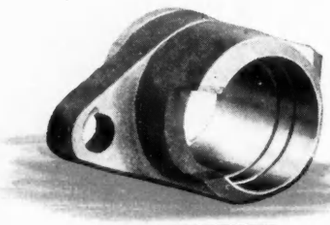


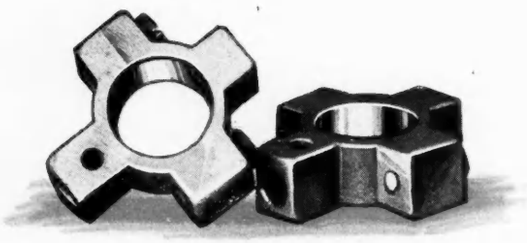
SPUR GEARS
Production — 100 per hour
Scrap less than 1/2 of 1 percent



BUSHINGS
Production — 40 per hour
Scrap was less than one percent



VALVE GUIDES
Production — 75 per hour
Scrap was almost negligible



CONNECTING ROD BEARINGS
Production — 80 per hour
Scrap so infrequent that it was disregarded

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SCRAP alone may warrant "blue ticketing" some of your present equipment. Old, hand operated, hand-plugging grinding machines, even if in excellent condition, can seldom meet today's requirements for accuracy and finish. Scrap in the grinding department is particularly expensive as it often means the throwing away of a finished piece.

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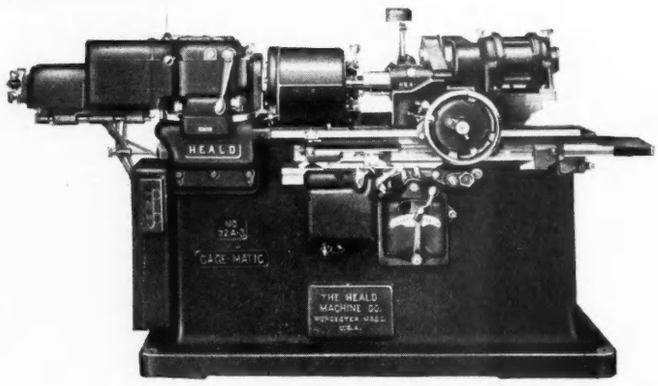
Our Service Engineers will gladly study your problems and submit data as to production, accuracy and finish to be expected when ground on the latest Heald Equipment.



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HEALD

AUTOMOTIVE INDUSTRIES

VOLUME 64 APRIL 4, 1931 NUMBER 14

Car Dealer Totals Drop 9% As Aftermath of Depression

by Leslie Peat

THE 1926-1930 trend toward exclusive passenger car dealerships* was reversed in 1930. During the past 18 months many dealers have been faced by the necessity of handling more than one line of automobiles, whereas from 1926 up to last year there was a continued shrinkage in the proportion of exclusive dealers to multiple dealerships, according to a recent count of the Chilton Trade List.

During the past year there was a net reduction of car dealers in the United States from 51,560 to 47,144. This represents a decrease of about 9 per cent, or 4416 dealerships. No figures are available of the number which went out of business; this total of 4416 dealerships under the figure for last year represents those who went out of business, less dealerships which opened up during that same period.

The net loss in the number of outlets handling one line of cars in 1930 was approximately 10 per cent (Table 1), whereas the number of outlets provided by multiple-line dealerships gained one per cent during the same year (Table 2).

This trend was more pronounced than these general figures would indicate, however, if Chevrolet and Ford dealers were excluded from the calculations. During the five-year period since 1926, these two lines have shown a considerable trend toward exclusive dealerships; this trend was somewhat more pronounced during the past year when combined, dealers for these makes of cars, showed a gain in exclusive dealerships which approximated 9 per cent.

As a result of the Ford-Chevrolet gain, the number of outlets for all other makes together naturally showed

* "Trend Toward Exclusive Dealerships," page 463, *Automotive Industries*, March 22, 1930.

Dealerships Lose as Repair Shops Gain

	1930	1931	Per Cent Change
Repairshops and Service Stations	101,189	102,556	+ 1
Number of car and truck dealers	54,354	50,990	− 6
Number of car dealers	51,560	47,144	− 9
Number of car dealers handling only one make	41,368	37,172	−10
Number of car dealers handling more than one make	10,192	9,972	− 2
Number of car dealer franchises by population groups:			
1,000 and under population	18,278	15,722	−14
1,001 to 2,500	12,624	11,039	−13
2,501 to 5,000	8,675	7,516	−13
5,001 to 10,000	7,001	6,833	− 2
10,001 to 25,000	5,737	6,986	+22
25,001 to 50,000	3,124	3,098	− 1
50,001 to 100,000	2,113	2,017	− 4
100,001 and up	5,502	5,393	− 2
Total number of car dealer franchises	63,054	58,604	− 7

Number of car dealer franchises is in excess of number of dealers because some dealers handle more than one line of cars and hence hold more than one franchise.

Competent Source

These figures, compiled by the Trade List Department of Chilton Class Journal Co., are the most authoritative and complete data of this nature extant. More than 75 employees keep this vast compilation of 127,000 names of dealers, wholesalers and manufacturers in the automotive industry accurate and up-to-date.

Table 1

Exclusive Dealerships Decrease 10% During 1930

Number of outlets handling one line, 1930	41,368
Number of outlets handling one line, 1931	37,172
Loss	4,196
Per cent loss	10

Table 2

Chevrolet-Ford Outlets Show Gain in 1930

Number of Chevrolet-Ford outlets, 1930	18,151
Number of Chevrolet-Ford outlets, 1931	18,391
Increase	240
Per cent increase	1

Table 3

Number of Outlets, Less Chevrolet and Ford

Number of outlets, except Chevrolet-Ford, 1930	44,903
Number of outlets, except Chevrolet-Ford, 1931	40,213
Loss	4,690
Per cent loss	10

bigger declines than indicated by the total figures for the industry. An idea of just what happened may be gained from Table 3.

Now, with Chevrolet and Ford excepted, a decided trend away from exclusive dealerships is seen; there was a 20 per cent decrease in the number of outlets handling one line in this category (Table 4) and an increase of four per cent in the number of outlets provided by multiple-line dealers during the past 12 months (Table 5).

About 45 per cent of the outlets—other than Chevrolet and Ford—were provided by multiple-line dealerships as of January, 1931, as compared with 38 per cent a year ago.

As a result of these changes, 81 per cent of the dealers handling Chevrolet and Ford cars do not handle any other make of automobile, as compared with the 75 per cent of a year ago. This picture is not quite accurate, however, because a part of this difference lies in the fact that this year's count shows about 700 few less Ford dealers reported that they were selling more Lincolns than they were a year ago.

The shrinkage in the total number of dealers will probably result in a more healthy condition from the dealers' standpoint, as there will be fewer to divide the total gross volume of sales. The resulting increase in relative sales volume per dealer will tend to reduce the overhead burden on retail car sales.

The shrinkage of dealers was bound to be most severe in towns under 10,000 population and there was a pronounced tendency among dealers in communities of this size to handle more than one line of cars. Both of these influences have worked toward an increase in average car sales volume per dealer. Thus far, the casualties among passenger car dealers do not appear to have approached the large totals which were reached during the depression of 1921, although the reduction in dealerships has been severe.

Although all of the returns of last year's dealer count have not been collected, there seems to be little reason to doubt that a substantial number of additional failures will be reported unless an unexpectedly sharp upturn in automobile sales comes to the rescue in the near future.

Because some dealers handle more than one line of cars, the total number of retail outlets of the different factories is greater than the number of dealers. The loss in the number of outlets was 4450 (Table 6), slightly greater than the 4416 reduction in the number of dealers.

Table 4

Exclusive Dealerships (Exclusive of Chevrolet and Ford) Decrease 20%

Number of outlets handling one line, 1930	27,695
Number of outlets handling one line, 1931	22,264
Loss	5,431
Per cent loss	20

Table 5

Multiple Dealerships (Exclusive of Chevrolet and Ford) Increase 4%

Number of outlets provided by multiple line dealers, 1930	17,208
Number of outlets provided by multiple line dealers, 1931	17,949
Increase	741
Per cent increase	4

Table 6

Car Dealer Outlets Decrease Seven Per Cent During 1930

Number of outlets, 1930	63,054
Number of outlets, 1931	58,604
Loss	4,450
Per cent loss	7

Just Among Ourselves

Few Changes in Financing System

A FEW conversations with individual dealers recently lead us to believe that some tendency might be evident this year for retailers to swing back from recourse to non-recourse financing of new and used cars.

That belief, we now know is incorrect.

Don Blanchard, editor of AUTOMOBILE TRADE JOURNAL, checked up on several hundred cases and reports definitely that practically all dealers who were using recourse at this time last year still are using it and that practically all who were using non-recourse still are using that form of financing. Only in about 8 per cent of the cases checked has there been any shift at all and even in that small group the shift is about as much one way as the other.

Alfred P. Sloan, Jr., On Fact-Finding

WE have just read with mixed feelings that little pamphlet titled "The Importance of Fact Finding" which Alfred P. Sloan, Jr. has just written as a message to General Motors dealers and their bankers.

The mixed feelings come about because the utterly true and economically sound statements which Mr. Sloan makes give rise—as one reads—to the feeling at one moment that we have before us just another collection of trite, copy-book maxims about how to run a business—and at the very next moment to the definite feeling that years of experience and study could not fail to arrive at just these well-known but little practiced conclusions.

To express thoughts pregnant with meaning and filled with poignancy, any author has available for use in trying to express new significances only the old words, which, through constant repetition have come to lose their potency.

On such a subject as the one Mr. Sloan has essayed, the writer is faced with the same problem as when he tries to write into a letter of sympathy to a friend the very real emotions which are in his heart; the old words through constant use have lost their meanings and the language provides no new ones to take their place. As a result many a message of new import has difficulty in surging over the dam of expression limitations.

A Message Well Worth Reading

WITH the rather long preface we recommend to every manufacturing executive careful reading of Mr. Sloan's message. For one who will read into the words used, their basic original meanings, there lies in this little pamphlet much of business wisdom and much of vital inspiration.

The distributing end of the automobile business, Mr. Sloan says "is essentially a complicated business." It requires "a high degree of managerial ability." "We cannot make progress in solving our problem by approaching it from the standpoint of 'hunches,' neither can we make progress if we bewail the fact that the problem exists, or if we blame others."

In Which He Says—

OTHER pertinent, isolated statements which might be chosen from the pamphlet include:

"Fact-finding can contribute (to the solution of business problems) only to the degree in which it is used intensively and aggressively. It would be greatly to be regretted should the thought become established that fact-finding in itself can contribute anything in the way of progress toward the solution of our problem."

"Each part (of expense) must be properly proportioned to the opportunity presented."

"The total expense is justified only when it produces a gross income in excess of total expense. It is not, therefore, a question of expense, but entirely a consideration as to whether the expense has a favorable influence on our profit position."

"If every dealer knew the facts, faced them aggressively, our problem in a practical sense would be solved."

"Lack of knowledge of the facts on the part of a single dealer influences adversely all other competitive dealers."

On the title page of this pamphlet appears the notation "No. 1," indicating, we suppose, that there will be more to follow. We hope so. The industry as a whole will be benefited thereby. Even such of those business fundamentals as have been commonly known become revitalized when brought back through the eyes of this chief of a great corporation.—N.G.S.

Four-Wheel Drive Will Improve the of Today's Higher Powered Cars

by P. M. Heldt

With 45 per cent of the weight of the car on the front wheels and 55 per cent on the rear, the weight available for traction purposes with different drives is about as follows:—

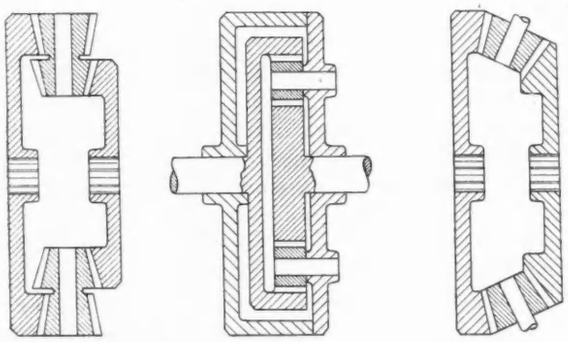
40% with front wheel drive
60% with rear wheel drive
80% with four wheel drive with ordinary differential between axles
100% with four wheel drive with special differential between axles

ONE of the next developments in the passenger-car field probably will be the use of four-wheel drive. For the present this feature will hardly be considered for vehicles of all classes, but only for cars designed to possess unusual performance characteristics.

In the truck industry the four-wheel type of drive has been used to a limited extent for a long time. All (or nearly all) of the trucks of the Army Ordnance Department, which in the event of war must operate over shell-torn roads close behind battle fronts, have this drive. In commercial service four-wheel-drive vehicles are preferred for use in countries or districts having few or no improved roads. Wherever road conditions are such that the "traction," or the adherence of the wheels to the ground, is likely to be subnormal, the four-wheel drive has a definite advantage over two-wheel drive, because with the former the whole of the weight of vehicle and load can be made available for traction purposes, whereas with rear-wheel drive only the weight on the rear wheel can be thus utilized. If steering is by the nondriving wheels, this fraction cannot well be more than 85 per cent, as otherwise the steering would not be sufficiently positive. In passenger cars, however, owing to considerations of riding quality, the weight is generally nearly equally divided between the front and rear wheels, and the limiting traction on two wheels therefore is much smaller.

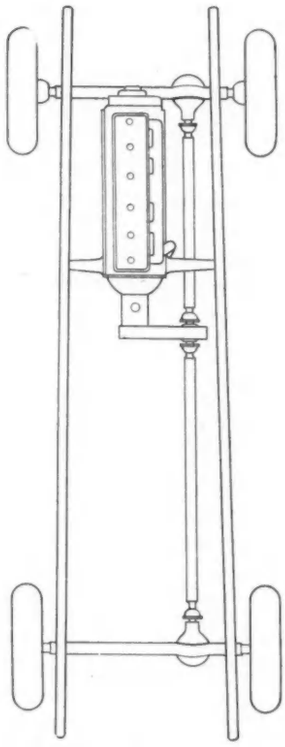
Adoption of the four-wheel drive for passenger cars, when it comes, will be based also on the need for increased traction. This need, however, will not be due so much to deficiencies of road surfaces as to the constantly mounting ratio of engine power to vehicle weight in passenger cars. Some 20 years ago one horsepower per 100 lb. of car weight was a good average, but this is now greatly exceeded. Most cars now have more than two engine horsepower per 100 lb., a good many have three, and in some the ratio even approaches four.

Difficulties due to this very high specific power are of two kinds. In the first place, when accelerating at the maximum rate, the stresses on the tires are very great if the drive is through two wheels only. Secondly, under these same conditions, when



The above illustration shows three types of differential which can be used to distribute the torque between the front and rear wheels in proportion to their respective pressures on the road surface, so as to make the whole of the weight available for traction + + + +

Get-Away



With the driving shaft set to one side the engine can be as low in the chassis as with the rear drive car of conventional design

the maximum torque is applied to the driving wheels, the adherence between the tires and the ground often is insufficient to resist the tangential force on the driving wheels; the wheels then will spin and the maximum rate of acceleration will be limited by the ground adherence rather than by the power available.

There is no doubt that many purchasers of these high-powered cars buy them because they expect superior "getaway," and if the car fails in this the owner is likely to be disappointed. From the foregoing it will be seen that failure to show superior acceleration may be due not to lack of engine power, but to inability of the driving wheels to utilize that power. This is where the four-wheel drive comes in.

With the various types of modern roads the coefficient of friction between the road surface and rubber tires is comparatively high as long as the road is dry, or clean when wet. When the road is covered with a film of greasy dirt or with snow and ice, the adherence is greatly reduced, and it is mainly under these conditions that the traction obtainable is insufficient.

As stated previously, with drive through the rear wheels only the weight on these wheels is available for traction purposes. Fortunately the driving torque transfers additional weight from the front to the rear wheels, but if the road surface is slippery, so that the driving torque cannot attain a large value, this transfer of weight also is proportionately reduced.

For passenger cars it is customary to figure on a proportion of 55 per cent of the total weight being on the rear axle and 45 per cent on the front axle when the car is not under power. These figures are averages for conventional cars with rear-wheel drive. To determine the maximum percentage of the total weight which can be transferred from the front to the rear wheels by driving torque we proceed as follows:

Let W be the total weight of the car and 0.55 W the weight normally on the rear wheels; then, assuming the friction coefficient between tire and road surface to be 0.7, the maximum circumferential force on the driving-wheel tires will be $0.7 \times 0.55 = 0.385$ W.

Calling the wheel radius r, the maximum torque on the driving wheels will be 0.385 r W, and if the wheelbase is w, the weight removed from the front wheels is 0.385W (r/w). In an average car with 30 in. wheels and 120-in. wheelbase, this ratio r/w is equal to $\frac{1}{8}$ and the expression for the weight transferred then becomes 0.048 W. Therefore, 4.8 or, in round figures, 5 per cent of the total weight of the car is transferred from the front to the rear wheels when the maximum driving force is applied to the latter. Thus under conditions of maximum driving torque applied we have a division of weight of 60 per cent on the rear wheels and 40 per cent on the front wheels, instead of 55 per cent on the rear and 45 per cent on the front of the chassis.

In the foregoing it has been tacitly assumed that both rear wheels carry the same amount of weight and have the same adherence to the ground, so that if the torque applied were gradually increased, both would begin to slip simultaneously. It sometimes happens that one of the rear wheels is in contact with a slippery portion of the road surface. In that case the total traction obtainable from the two rear wheels is limited by the coefficient of friction between the rubber tire and this slippery road surface, because the differential gear through which the two rear wheels are connected will not transmit any more torque to one wheel than to the other. Similarly, if the load were unequally divided between the two rear wheels, one supporting, say, twice as much as the other, the traction obtainable from the two rear wheels would be limited by the weight on the most lightly loaded wheel, and the extra weight on the other wheel would be of no use whatever for traction purposes.

The same conditions are met with in four-wheel-drive vehicles if a differential gear is interposed between the propeller shafts connecting to the front and rear axles respectively. If the usual layout is employed, with one propeller shaft extending from

a "transfer gear" to the front axle, and another to the rear axle, a differential gear between these two propeller shafts seems necessary, because, in the first place, when describing curves the radii of the tracks of the front wheels are larger, respectively, than the radii of the tracks of the rear wheels, and, secondly, the average effective diameter of the two front wheels may not be the same as the average effective diameter of the rear wheels, owing to differences in the state of wear or in the degree of inflation of the tires.

At least one racing car to enter the Indianapolis Speedway race this year will employ four-wheel drive at the get-away and in accelerating through the turns. A dog-clutch will be used to bring the rear-drive into action when needed for increased tractive power.

Now, if a differential gear is used between the front and rear axles and the effective load on the front wheels is only two-thirds as great as that on the rear wheels, then, of course, the maximum traction available will be determined by the load on the front wheels. In the case under consideration here, with 40 per cent of the total weight on the front wheels, only 80 per cent of the total weight is available for traction purposes, instead of 100 per cent. In order to make the whole of the weight available we may either change the weight distribution, employing some of the expedients resorted to in connection with front-wheel drive, such as placing the storage battery under the hood, or we may use a modified differential which, instead of dividing the torque equally between the two side gears, divides it in the proportion of the effective weights on the driving wheels to which these side gears are connected. Three types of differential possessing this quality are illustrated herewith. Assuming a normal distribution of weight of 55 per cent on the rear wheels and 45 on the front wheels, we then get the following percentages of total weight available for traction purposes for different types of construction:

Front-wheel drive, 40 per cent.
Rear-wheel drive, 60 per cent.
Four-wheel drive with ordinary differential between axles, 80 per cent.
Four-wheel drive with special differential between axles, 100 per cent.

The advantages which four-wheel drive offers with respect to maximum acceleration are similar to those offered by four-wheel braking with respect to maximum retardation, although proportionally the advantage gained is not quite as great. With four-wheel brakes a car can be stopped in substantially half the distance as with rear-wheel brakes only. Application of the brakes transfers weight from the rear axle to the front axle, and if the original distribution is 55 per cent on the rear and 45 per cent on the front axle, a transfer of weight of 5 per cent of the total from the rear to the front axle gives an even division, hence the front brakes should have the same power as the rear brakes. That this is so is shown by tests made at the Bureau of Standards some years ago, which gave an average maximum deceleration of 11.1 ft. p. s. p. s. for cars with two-wheel brakes and of 20.9 ft. p. s. p. s. for cars with four-wheel brakes. The gain in traction with four-wheel drive over rear-wheel drive under the conditions above outlined would be 33 1/3 per cent with the ordinary differential between the axles and 66 2/3 per cent with a differential distributing the torque in proportion to the effective loads on the front and rear wheels.

Maximum stresses on the tires are greatly reduced by the use of four-wheel drive, and the tire life therefore may be expected to be considerably increased. Increase in tire life is an advantage which has been strongly stressed by manufacturers of trucks with four-wheel drive.

Four-wheel drive does not appear to involve any particular difficulties of design. The powerplant can be mounted in the usual position and the drive taken from the rear end of the transmission, either by toothed gearing or by chain, to a differential gear with its axis parallel to the crankshaft, from which propeller shafts connect to the front and rear axles. It would, of course, be impractical to place the engine so high that the propeller shaft to the front axle could be run underneath it, hence the differential referred to and the propeller shafts must be located to one side of the center.

About the only thing that calls for a somewhat different arrangement of the powerplant is the fact that the front axle cannot be dropped at the center, but must extend straight across in line with the front wheel axes, unless it is decided to have a final gear reduction directly at the wheels, which would hardly appeal to the engineer. The housings for the final drive gears will not be at the center of the axles, but offset to one side. Moreover, if bevel-gear drive is used, the pinions have to be on opposite sides of the driven gears at the two ends in order to cause the front and rear wheels to turn in the same direction.

With the arrangement above outlined three differentials would be required, one between the two propeller shafts and the other two in the axles.

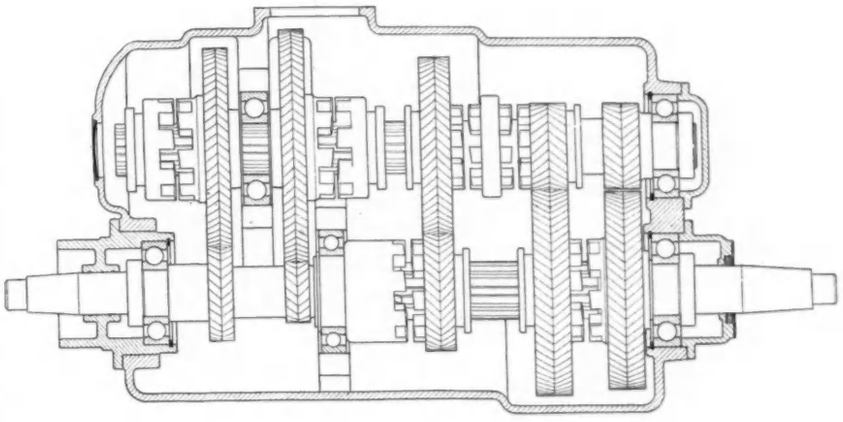
In connection with the subject of four-wheel drive the question naturally arises whether it would not be advisable to also use four-wheel steering. From a design standpoint the combination of four-wheel driving and four-wheel steering has certain advantages. In the first place, since with four-wheel steering the front and rear wheels on the same side of the car always follow the same tracks, it would probably be possible to dispense with two of the three differentials, those in the axles. On the other hand, two pairs of propeller shafts and two pairs of final drive gears would be required. The axles in this case would be symmetrical, having a driving-gear housing near each end.

Another advantage of the four-wheel steering arrangement would be that, since the axle driving shafts extend only from the driving-gear housings to the wheels, the center of the axles could be "dropped," which would permit of placing the radiator as low as on the conventional car.

From the operating standpint the four-wheel steering feature is not so attractive, however, for when one is parked alongside a curb, with another car close in front, it is more difficult to get away from the curb with a car with four-wheel steering. In swinging the front wheels away from the curb the

(Turn to page 546, please)

Five-Speed Transmission of Cotta Gear Can Be Shifted Without Declutching



Details of the shifting members

SINCE the introduction of its five-speed transmission (see *Automotive Industries*, Dec. 29, 1928), the Cotta Gear Co., Rockford, Ill., has further developed this unit and incorporated in it a number of interesting features, including herringbone gears for quietness and a ratchet-type of dog clutch engagement that permits gears to be shifted without declutching.

It is the contention of Charles Cotta, president of the company, that the demand for increased torque for acceleration and hill-climbing ability in buses and trucks can be supplied more economically by the use of a multi-speed transmission that is efficient and easy to shift than through the adoption of larger engines. Mr. Cotta contends that since the average truck today, when running in level country at the governed speed of the engine, requires only a small fraction of its maximum available horsepower, any further increase in engine power would result in unnecessary raising of the ton-mile cost.

It will be remembered that recent types of this company's five-speed transmissions have been operated through a single shift lever, the five speeds being obtained by the use of two sets of constant-mesh countershaft drive pairs. This design has been retained and handling made still easier by the incorporation of a ratchet type of dog clutch. The accompanying drawing shows the design of the shifting members.

The faces of the teeth of the dog clutches are machined at an agle, so that engagement is automatically prevented as long as there is relative motion in one direction. However, if the direction of the relative motion between the two members to be meshed is reversed, the members will automatically take hold by sliding into partial engagement along the inclined faces.

In practice the shift works out somewhat as follows: In shifting from one gear to a higher gear, while getting under way, the gearshift lever is flicked into neutral as the foot pressure on the accelerator is relieved. The lever is then moved into the gate of the gear to be engaged, bringing the faces of the clutch members into contact. As long as the engine driven gear or shaft is running faster than the mating part, engagement is impossible. When the engine speed has dropped to synchronous speed or just slightly below, however, a slight pressure on the shift lever which has been maintained during this interval causes the high "edges" or "corners" of the clutch members to butt against each other, since the relative rotation of the two members has been reversed, and the shift can then be "completed" by sliding into engagement.

The design thus calls for synchronization of engine and axle speeds in the ratio of the gear to be engaged, without requiring any guesswork on the part of the operator as to the exact speed at which the two halves of the engaging dog clutches will be in synchronism.

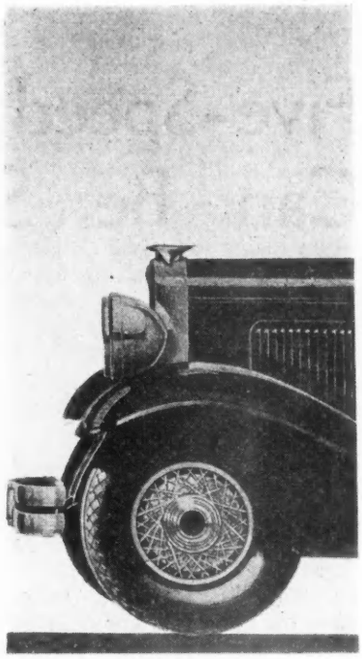
Mr. Cotta states that he uses herringbone gears because of their self-centering characteristic, which results in equal load distribution between the halves of the gear teeth, and because of their improved lubricating characteristics and of the lower liquid fluid friction.

The first advantage claimed is obvious, since the necessity of locating the idler gears endwise on their shafts is eliminated. The second reason is explained by the tendency of the herringbone gear to act as a scoop in running through oil. Further, the gears are arranged in such a manner that the centers of the teeth mesh first, which prevents trapping of lubricant between teeth, that would have to be squeezed out later through small clearances (fluid friction).

In the new transmission, developed by the Cotta Gear Co., gear ratios are in almost perfect geometric order. Thus the ratio in first is practically twice that in second. Second is about twice that in third, which is approximately twice that in fourth. The latter has a ratio of 1.43 to one, with direct drive in fifth. These ratios permit operation at virtually all times between the engine speeds corresponding to maximum torque and maximum horsepower, which is the maximum economy ranges of the average engine.

To demonstrate this transmission to a number of truck and bus manufacturers, Mr. Cotta has placed a unit in a truck of 20,000 lb. gross rating but has substituted an engine of ¼ in. smaller bore than standard, and has lowered the axle ratio to 4.6 to 1. In spite of these changes the truck has a really creditable performance.

Body Noises Being Reduced To Meet Demand of Owners



by Joseph Geschelin

BECAUSE the buying public has grown to expect freedom from noise in automobiles, the body maker must be keenly alive to the demands made on his product. For the ever increasing demand for closed bodies, coupled with higher road speeds, makes noiseless construction one of the major factors in body design and manufacture. Fortunately, no really obscure problems are involved so that generally a thorough treatment of certain fundamental principles will produce an acceptable body job. However, what complicates the situation is that not only must the body structure be made silent but it must also be soundproofed and insulated from outside effects which tend to filter in. Body silencing therefore goes hand in hand with the chassis designer's work of making quiet running engines and running gear.

Through the generous cooperation of a number of outstanding body manufacturers, this article presents some of the latest slants concerning the sources of objectional noises; approved methods for eliminating them, and discusses some of the recently developed materials especially designed for this work. The study will appear in two parts, this one dealing with the fundamental aspects of the problem, while the second, to be published soon, will show actual practice in some of the body plants.

In general, the sources of body noises are as follows:

1. Vibration or drumming in body panels.
2. Vibration or drumming in door panels.
3. High frequency vibration in the dash.
4. Squeaks due to frictional contact in the wood frame on composite bodies.
5. Squeaks due to frictional contact between metal and wood.
6. Weave in the door structure.
7. Window squeaks.
8. Rattles and squeaks at metal to metal joints.

According to recent experimenters, a great deal of the usual driving fatigue is a direct result of noise, particularly reverberation or reflection of sound. It is thought also that the objectionable nature of sound sometimes is due to a difference in quality or tone. Consequently with changes in body design or refinements in the structure, care must be taken not to introduce unusual or different sounds.

Since the specific problems of body silencing differ with the nature of the design, for the purpose of analysis we show below the principal variations in body construction:

1 all-steel with wood roof
- (a) sill-less,
- (b) with wood sill.

2 composite
- (a) all-steel front, wood frame, steel doors,
- (b) all-steel front, wood frame, wood framed doors,
- (c) above with wood sills, or
- (d) with steel underbody.

Other conditions being equal, in type 1, the chief problem is that of vibration or drumming of door and body panels, while in type 2 it concerns the silencing of squeaks in the frame structure, and between metal-and-wood and metal-and-metal joints. Another consideration in the latter type is the matter of wood preservation to inhibit the effect of dry rot and the action of termites and other insects.

Now let us get down to the details of the noises and the means employed to eliminate them. On

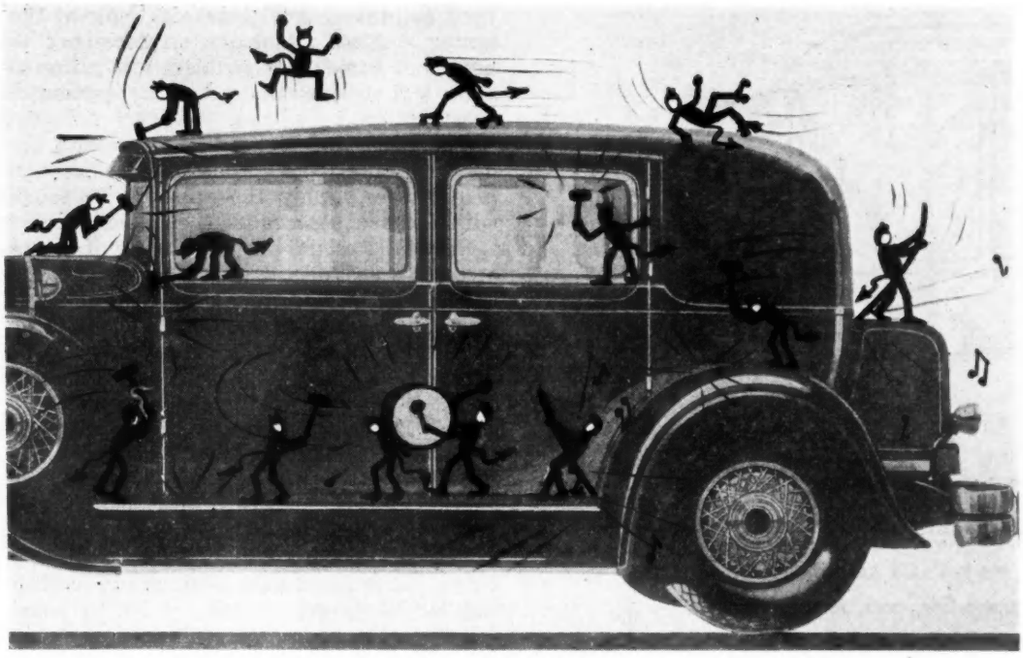
Table 1

Passenger Car Production by Body Types

(Percentages)

	1930	1929	1928
Roadsters	3.7	7.8	7.0
Touring Cars	3.3	4.6	7.4
Coupes	18.0	17.2	16.4
Other Closed Types	75.0	70.4	69.4

From Statistical Issue—Automotive Industries, February 28, 1931.



Here is the first of two articles on eliminating the noisy imps of driver annoyance from the modern body. The second will appear April 18

an all-steel body, the vibration of door and body panels is attributed directly to a drumming effect characteristic of large flat surfaces. The remedy is to employ the cheapest possible means of damping the vibration. One common method, almost universally used, is to spray the doors and body panels with a deadener of plastic emulsified asphaltum. To be really adequate, this plastic coating must be sufficiently thick (possibly ¼ in.) and must cover the entire surface with reasonable uniformity. A thin coat applied over small areas or even a good coat with a lot of thin spots will be a total loss.

Kersey cloth or jute felt pads also are found to be very effective for this purpose and are used by some body builders. It is suggested, however, that the plastic coating not only is as effective but somewhat more economical. However, the latter must be carefully applied and with sufficient thickness or it will suffer by comparison. Damping of vibration is also effected by the use of wood or metal strainers with a pad of felt or sponge rubber at the area of contact with the panels. In some cases, the body designer finds it expedient to use both the strainer and deadener to assure completely silent construction.

About the most interesting thing we found in this field was a direct method of quantitatively measuring vibration, thus placing this study on a real rational basis. This is done by means of the Lee Vibrecorder (patented) Fig. 1, which is used by R. K. Lee of Chrysler. According to Mr. Lee it is "an instrument for recording vibrations or oscillations of any moving parts in which the amplitude is less than 1/32 of an inch. The frequency may vary from 0 to 200 cycles per second. An amplifying mechanism transmits the vibration movement from the pointer to a brass stylus which draws the vibration curve on a specially prepared Crosby indicator paper. The paper is held on a cylindrical drum which revolves once, making a fixed time cycle which may be used for frequency reference.

"An adjustable governor provides a means for changing this time cycle if the vibration frequency is extremely low or extremely high. An electric magnet operated by an electric circuit, interrupted by any

Fig. 1 — The Lee Vibrecorder records body vibrations or oscillations in which the amplitude is less than 1/32 of an inch

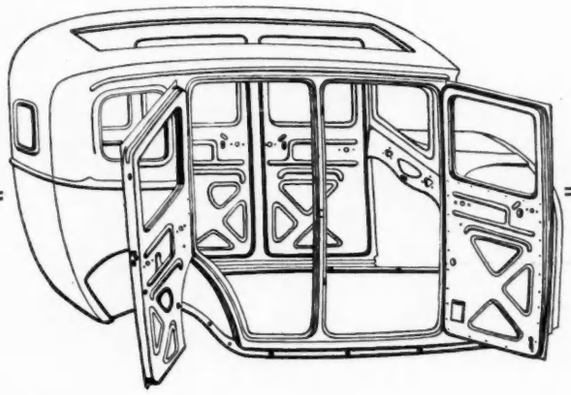


Table 2

Some Points of Insulation and Materials Employed

Chassis strips—felt, cork waste carpet

Body shims—waterproof felt, cork, rubber blocks

Floor board padding—felt (generally)

Dashboard gaskets—felt, cork

Rug lining—felt, jute fabric

Tool compartment liner—felt, kersey cloth

Roof padding—felt, wadding

Header channel—felt, molded rubber

Door bumpers—molded rubber, felt

Glass bumpers—felt, felt pads, molded rubber

Door panel pads—felt, kersey cloth, jute

Windshield frame—cork fabric, dum-dum

Formed gaskets for accessory brackets, lamps, etc.—cork, rubber, waterproof felt

Metal to metal, wood to metal joints—felt strips, sponge rubber, anti-friction tape, double-faced or single-faced cork fabric

Glass channel—waterproof felt, molded rubber

moving part on the engine or vibrating body, actuates a second stylus which indicates the time cycle of the engine exactly opposite the vibration record. This makes it possible to time the vibration accurately with the engine for determining phase relation of the vibration.

"The instrument weighs approximately six pounds, and due to the fact that the average time is one revolution of the drum for one second, it will readily be seen that it is impossible for the operator to move his hand, holding the instrument at any speed which will affect the vibration record, since it is usual that the vibration frequencies are at least 10 to 100 cycles per second."

Since the question of doors is common to both the steel and composite body, it might be just as well to discuss it separately. The drumming of the all-steel door already has been mentioned. On composite bodies with wood frame doors, rumbling is almost negligible because of the damping effect of the wood structure. In most cases, a strainer is used to provide additional damping at the center section. And it is interesting to note that some body builders are going to a vertical strainer instead of the horizontal construction.

The general design of the door and the door framing have a good deal to do with body noises. Only those closely in touch with the problem realize the importance of such details as the proper spacing of rivets or screws around the frame to prevent the weaving or buckling of the intervening sections. Selection of the right kind of door accessories as well as the design of the dovetail and its location are vital. A poorly designed dovetail will produce plenty of noise. The door hinge is another important element. Primarily it must be of adequate size to carry the door structure without permitting a transference of the load to the lock or dovetail. One body builder has gone to the extent of providing a lubricated door hinge. It is fitted with a hinge pin having angular oil grooves which are fed by holes drilled in the body of the hinge.

What are the silencing problems in composite body construction? Foremost is the matter of waterproofing and preserving all wood parts against dry rot, fungus, and the ravages of insects. Many types of commercial wood preservative are employed, including the use of body slush at assembly. Theoretically, body slush should be an excellent wood preservative because it consists of a mixture of salvaged ends of fine varnishes and oil paints. Actually it is not always fool-proof because it often contains a larger percentage of poor ingredients.

Despite all precautions, dry rot is still encountered in isolated cases, not only on automobile bodies but on many bus and commercial jobs, particularly those operating in the tropics and South America. Dry rot also occurs in Louisiana and Florida where particularly severe humidity and temperature conditions exist. In the course of our investigation along this line, we learned that J. G. Brill of Philadelphia, well-known makers of rail cars, have had excellent results with "Saum's Preservative" for wood which effectually inhibits the effect of moisture and insects under the most severe tropical conditions. Their experience with this product dates back about 12 years.

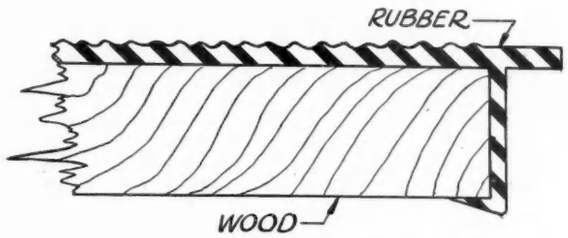


Fig. 2—A rubber-covered floor board is used to dampen noise and form an anti-friction joint + +

With some exceptions, the majority of the automobile bodies in production have some wood work exposed during the operations of cleaning panels and body finishing. These parts, usually the roof bows and roof rails, require additional protection wherever the wet deck is employed. As a measure of safety, these points are usually given an additional coat of wood preservative prior to the finishing operation.

Glued framing joints are virtually a thing of the past. The general practice today is to have well-fitted joints with some clearance laterally, fastened together permanently with screws or bolts and completely bedded in anti-friction paste. The best type of anti-friction paste appears to be a combination of graphite and asbestos in an oil vehicle. One of the newer materials for this purpose is the so-called rubber dough, a putty-like material which vulcanizes while the body is going through the finishing over. Metal to wood, and metal to metal joints, such as between body panels and the frame or door panels and frame, are silenced in a number of ways, including the use of friction tape, blue wadding, felt strips treated with anti-friction paste, and sponge rubber.

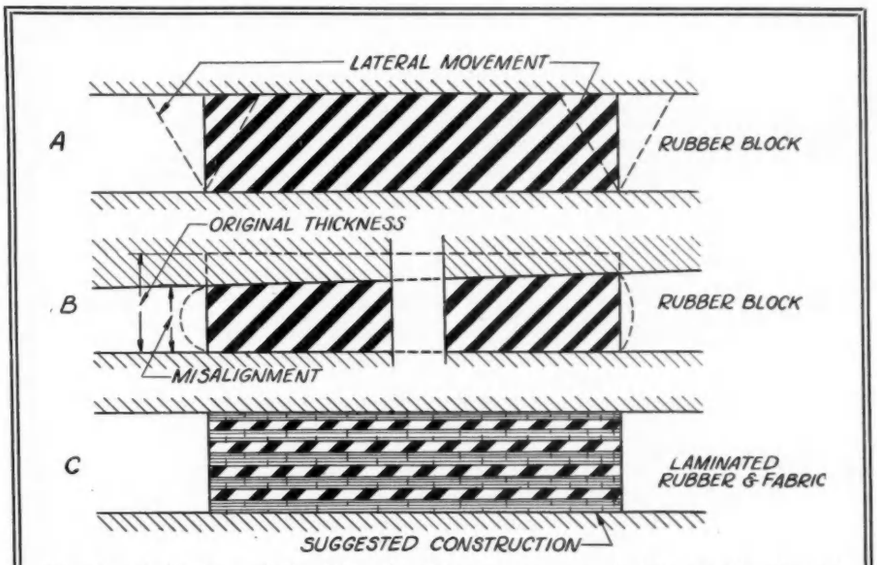


Fig. 3—R. K. Lee of the Chrysler Corp. recommends shims of laminated fabric-rubber molded blocks + + + + + + + + + + +

Now we come to the details of insulation and sound-proofing common to practically all bodies. Chief of these are: **(1)** insulation against heat and cold, and damping of vibration of the dash; **(2)** floor board insulation; **(3)** insulation of seat pans; **(4)** roof bows.

Dash insulation is a thoroughly conceived job on present-day cars. One popular construction employs several layers of material. The first is a jute pad which serves to damp high frequency vibrations in the panel, while an inner layer of insulating material serves as a seal against heat and cold. Incidentally since the jute pad has excellent sound absorption properties it serves the double purpose of a damping device and sound absorption medium to insulate against noises under the hood. For decorative purposes, the interior is lined with a sheet of pressed cardboard. The total thickness of the insulation is more than one inch.

To eliminate drumming, also to serve as heat and cold insulation, seat pans are lined with pads of felt or jute laid directly on the floor. An interesting floor board construction is the newly introduced rubber covered board (Fig. 2), with the rubber on the top surface extending over the sides so as to provide an anti-friction joint between adjacent boards. A similar construction has been employed on some running boards where the rubber coating is extended on both sides and serves as the insulating material between the running board and apron. On roof bows the usual practice is to tack a strip of felt, wadding or salvage trimming material between the wood and the wire netting. In some quarters, it is felt that the use of wadding or salvage material is not so economical because of the difficulty of cutting into strips of uniform width. Felt, of course, can be obtained in rolls of uniform width and simply cut to length.

Recognizing the unmistakable trend towards cars with a lower center of gravity and the consequent lower roof construction, some designers are beginning to think seriously about all-metal decks. They reason that with lower bodies the roof will become more prominent and will require special treatment. Certainly an all-metal roof will permit the carrying out of interesting color schemes. But the metal deck will bring with it some serious problems which will certainly complicate the present noise situation. Still it may not be quite as serious as it seems when we recall that the metal deck was tried a long time ago when bodies were not as well designed nor as well insulated so that the results and impressions of that period may not hold today.

Nevertheless the metal deck would add two effects: first, a natural vibration or drumming, and, second, reverberation due to reflected sound.

The first of these may be readily eliminated by designing a roof structure which would provide the desired damping effect. To further assure freedom from vibration or drumming, sections of the roof may be sprayed with a plastic deadener or pasted up with kersey cloth or felt.

The problem of reverberation or reflection of noise is far most serious. Fortunately we can draw upon the experience in other fields for information concern ing sound-proofing and acoustics. Theoretically at least most of the reverberation may be inhibited by the use of a sound-absorbing medium such as a thick hair felt or coarse jute fabric. Consequently, all the surfaces in the ceiling should be of porous or sound-absorbing material to damp the sound waves. In the case of large areas, it has been found desirable to break up the surface into irregular patches to further break up the regularity of the sound wave fronts. Following this line of reasoning, it may be advisable to use a soft porous weave fabric for the ceiling material to permit noises to filter through to the sound-proofing material in the roof.

While on the subject of roof construction, we noted considerable interest in the possibility of using metal roof ribs. The use of light stampings here would

permit of a very light but inherently strong deck structure. But, in addition, it would eliminate joints and assure complete freedom from noise at this section.

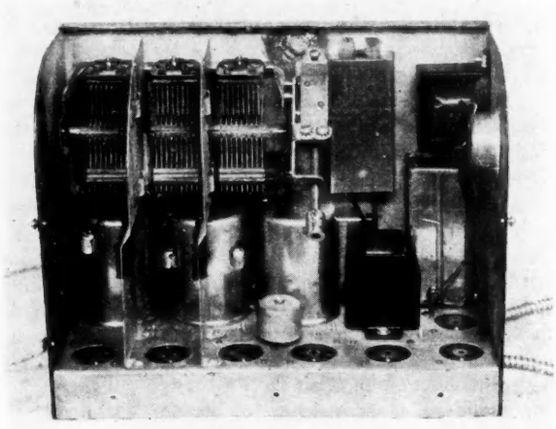
Of great interest to body designers is the steady improvement in the materials used for silencing and the introduction of some newer products in this field. Felt, the old standby, is a highly efficient silencing medium because it not only insulates against friction but also has sound-absorbing properties. For specific automotive purposes, felt is being offered specially processed to prevent glazing and well waterproofed for exterior joints.

Cork is another material which is finding application. It is a fine sound-absorbing medium and possesses the resiliency required for shims and gaskets. Moreover, it can be formed into all sorts of intricate shapes within fairly close tolerances, thus lending itself to the needs of mass production. One of the outstanding developments in this field is a rubber-bonded cork material which is being marketed by one of the large cork companies. This material is made in two forms—1 a fabric coated with the cork-rubber for use in setting glass in windshields and rear window frames and 2 a double-faced material made up of fabric coated with cork-rubber on both sides. The latter is recommended for use as chassis strip, body shims, and on other joints where resilience and anti-friction effects are desired.

More and more rubber is being used in body-silencing work. The use of rubber for coating floor boards and metal running boards already has been mentioned. At present the most interesting application is for body shims, According to experimenters in this field, the use of solid rubber blocks should be avoided because of the "cold flow" and lateral movement which are present and the tendency of these effects to produce a decided body "wiggle." Incidentally, because of the "cold flow" characteristics, there is a serious possibility of misalignment in the body structure, sometimes sufficient to cause a binding of the doors. One of the prominent experimenters in this field of rubber technology is R. K. Lee of the Chrysler Corp., whose latest work is described in the paper entitled "Rubber Problems Confronting the Automotive Engineer," which was read at the last annual meeting of the Society of Automotive Engineers. For body shims he recommends the use of laminated fabric-rubber molded blocks. See Fig. 3.

Judging by the constructional details, which will be described in the second article, it is evident that everyone concerned with body engineering and manufacture is keenly aware of the problems involved in body silencing. And every effort is being made to produce an inherently silent structure by refinement in design and the use of the newer materials that are now available.

Radio for Automobiles



Photograph shows chassis, with the front casing removed. When installed the base of set is on top, so that tubes are upside down + +

PHILCO will produce a new Philco-Transitone screen-grid automobile radio set which will be merchandised on a quantity basis throughout the country by both radio and automobile dealers.

The new set, the product of the combined efforts of both Philco and Transitone engineers, will sell for $65 with seven balanced Philco tubes. Installation charges, long one of the major problems of automobile radio selling, have been fixed at a uniform figure.

Installation and "B" batteries will bring the total cost to the consumer to $99.80. An additional charge of $10 will be made for aerial installation.

The radio is self-contained in one unit except for the speaker. Both electro-dynamic speaker and receiver are mounted on the dash out of the way.

The control panel is mounted on the instrument panel and combines convenient, accurate control of the receiver with neat appearance.

The speaker is a specially designed electro-dynamic speaker that for the first time in automobile radio reproduces the low as well as the high tones.

The receiver employs three type-24 screen grid tubes, two type-01A tubes, and two type-71A tubes.

Four-Wheel Drive Improves Get-Away

(*Continued from page 540*)

rear wheels are swung toward it, and the inside wheel therefore may bump into the curb.

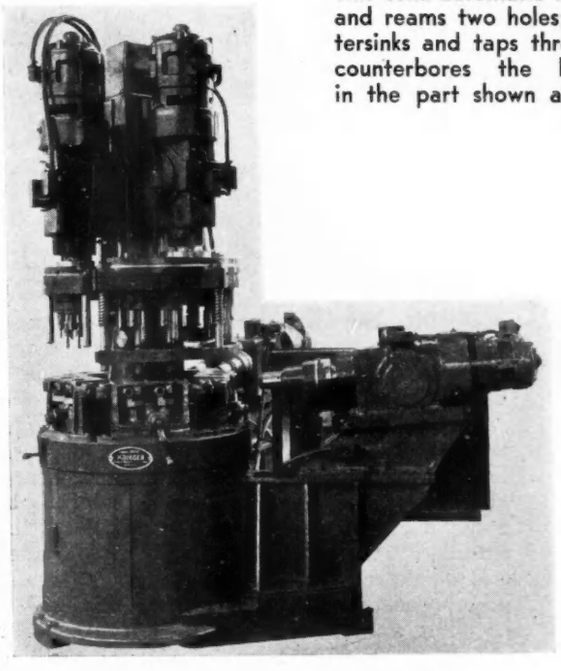
Moreover, steering by all four wheels would introduce an additional traffic hazard. If a driver turned his car sharply to one side, the rear end of the car would be likely to run into a passing vehicle. It is understood that in connection with four-wheel trucks for the Army, a steering device has been developed which permits all of the wheels to be deflected the same way, so that the truck can be moved away from the curb sideways and can dodge oncoming traffic. It would seem, however, that any complications in the steering gear involve an element of danger.

Semi-Automatic Machine Finishes All Holes in Steering Gear Case

THE semi-automatic machine shown here for drilling and reaming two holes, drilling, countersinking and tapping three holes, counterboring large recess in the top face, rough and finishing small counterbore in barrel end of part, was recently designed by the Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich. By the number of operations just mentioned the capacity of machine can be easily appreciated. The semi-automatic feature enables the operator to load and unload the parts while the machine is in operation without starting or stopping any of the units. Three multiple-head units mounted on the vertical column of the machine proper with two additional multiple units forming two side units comprise the machines. The units are individually operated by an automatic drilling and tapping motor-driven unit.

There are five individual fixtures mounted on an automatic rotary table, and each fixture holds two parts. The part is located in the fixture horizontally over a plug that is flattened both top and bottom and is forced back against the end of the plug and up against the large flat face by means of an equalizing clamp operating through a pinion and jig lock. By registering the large flat face against the end of the plug the accuracy of location between the hole in the barrel and the two dowel holes in the large flat face is held with respect to within plus or minus 0.001 in.

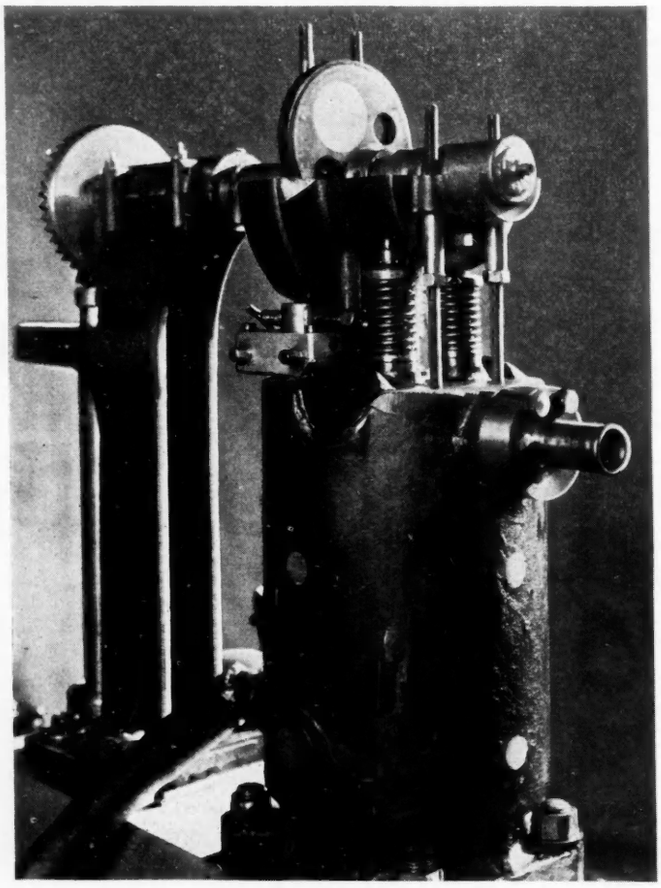
This semi-automatic machine drills and reams two holes; drills, countersinks and taps three holes and counterbores the large recess in the part shown above + +



The operating cycle is as follows: At the first working station the large recess in the flat face of the part is counterbored, and one of the heads mounted in an angular position on a side unit rough counterbores the long hole in the body of the part. The counterbore used in this operation is piloted with a roller pilot in the main locating plug. At the second station five holes are drilled in each part. In addition to the drilling of these holes the long bore is finish counterbored with another roller pilot cutter by the second multiple head mounted on a side unit. At the third station three holes in each of these parts are countersunk and the two dowel holes are reamed, these being the same five holes as were drilled in the previous operation. At the fourth station three holes are tapped in each part which finishes the operations required on the casting.

The complete machine is electrically synchronized so that the automatic rotary table cannot be indexed during any operation or when any of the units are in the back position. As soon as all the units are in the back position the table is automatically indexed. After this operation all units are automatically started on their respective operation.

Jalbert Heavy Oil Engine Using Cylinder Under Construction for



Before being placed in production the French government conducted experiments on this single-cylinder four-cycle model + + + + + + +

By reason of the small lift and quick return of the automatic valve, higher engine speeds are possible than with the usual type of pump and injector + +

THE use of a carburetor and a pre-mixing and compression cylinder is the feature of the six-cylinder 200 hp. Jalbert engine which is now under construction for the French Air Service, after experiments with a single-cylinder model.

The engine is a six-in-line of 125 by 180 mm. (4.92 by 7.09 in.) bore and stroke, which will develop 180 hp. at 1930 r.p.m. It has steel cylinders on an aluminum crankcase, with sheet steel welded-on jackets, and a seven-bearing crankshaft. Two vertical valves are mounted in the head, being operated by two separate camshafts through pushrods and rockers.

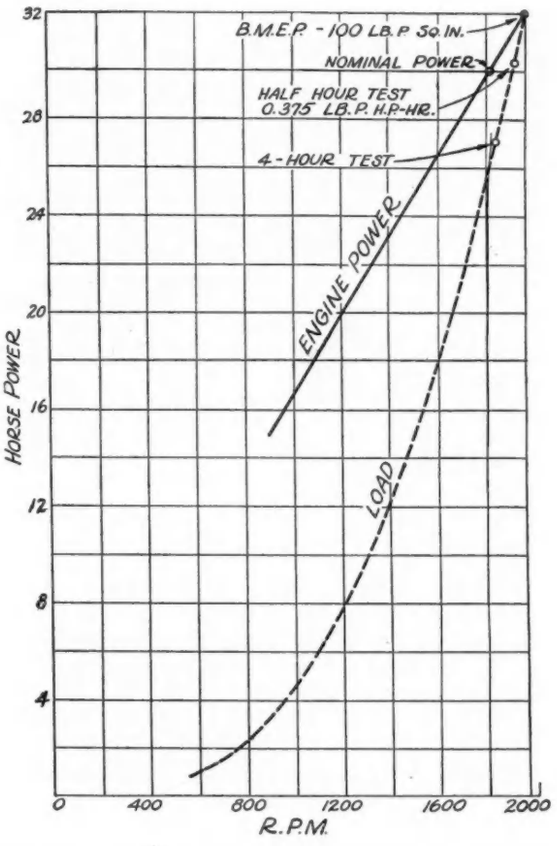
In place of the fuel pump and injector usual on Diesel engines, the engine has a carburetor which feeds a small cylinder mounted on the head of each working cylinder. The small cylinder is fitted with piston connected up to an overhead crankshaft by means of a connecting rod, and running at half engine speed. Connection is made between the fuel cylinder and the working cylinder by means of an automatic valve having a very small lift. On its down-stroke the fuel piston uncovers a port connecting with the carburetor and thus draws a mixture into the cylinder. This mixture is compressed on the return stroke, while air is being compressed in the working cylinder. Approximately at upper dead center of the two pistons, with a timing which gives a slight lead of the fuel piston over the working piston, the automatic valve opens and the mixture passes into the working cylinder. Compression is higher in the fuel cylinder than in the working cylinder; the lift of the valve is stated to be only a few hundredths of a millimeter, and the closing is very rapid by reason of the immediate rise in pressure in the combustion chamber. All possibility of preignition in the fuel cylinder is avoided by reason of the richness of the mixture, which does not become inflammable until it is mixed with the air in the working cylinder. It is claimed that by reason of the small lift and quick return of the automatic valve, higher engine speeds can be obtained than with the usual type of pump and injector. Other advantages are a completely atomized mixture and more nearly equal distribution to the cylinders than is obtainable with a pump.

Carburetor and Pre-Mixing the French Air Service

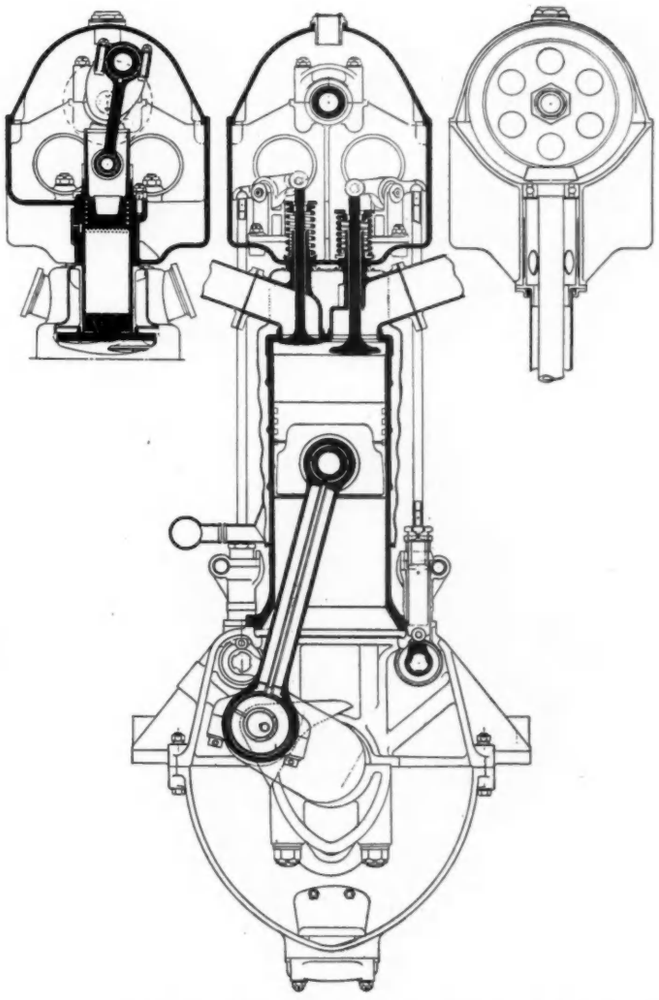
by W. F. Bradley

The carburetor is a simplified type comprising a jet in a venturi tube and a needle valve regulating the amount of fuel admitted. The fuel is broken up by being made to pass between a diaphragm and a flat polished surface of the carburetor, against which it is normally pressed by a coil spring. Adjusting screws allow of varying the pressure of the diaphragm against the flat surface.

Before the aviation engine was put into production official tests were carried out under government control on a single cylinder four-cycle model of 130 by 160 mm. bore and stroke. During the four-hour test 27 hp. was held at 1860 r.p.m. and 30.3 at 1933 r.p.m. for a period of half an hour. Under this test the consumption of gas oil was 0.375 lb. p. hp.-hr. Another experimental single cylinder engine of 3.54 by 5.51 in. bore and stroke developed 11 hp. at 1600 r.p.m., 14 hp. at 1920 r.p.m. and peaked with 14.3 at 2000 r.p.m. Gas oil having a specific gravity of 0.87 at 60 deg. Fahr. was used for these trials.



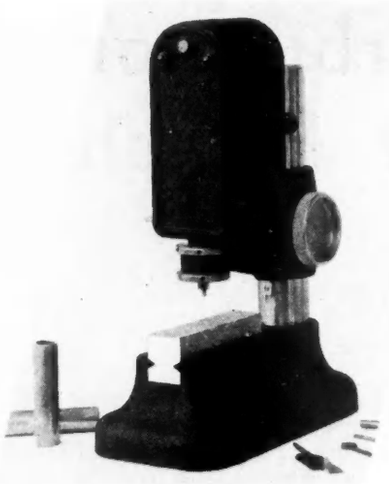
During the four-hour test 27 hp. was held at 1860 r.p.m. Gas-oil was used for fuel + + + +



This illustration shows a transverse section through the six-cylinder engine, while the two smaller views show the fuel cylinder and the drive for the crankshaft + + + + + + + + + + +

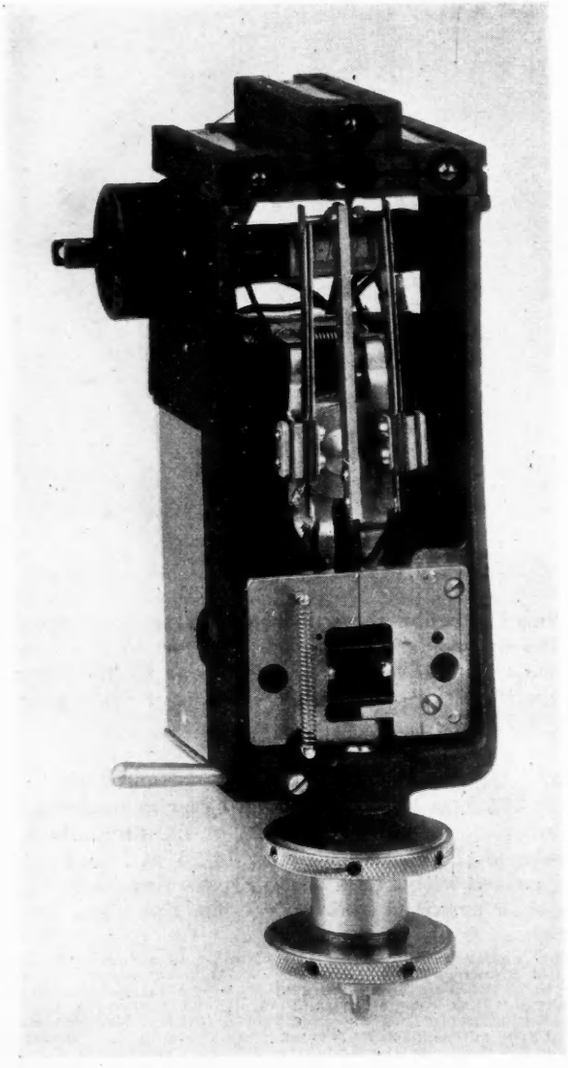
This engine seems to be quite similar in principle to an engine known as the Romeiser, which was announced at length in the *New York Times* of Monday, March 30, with a statement that French aviation circles were showing great interest in it. In response to a cabled inquiry, Mr. Bradley, our Paris correspondent reports that there is no apparent connection between the Jalbert and Romeiser engines.

Signal Light Readings on Reed Indicator Gage Show Slight Variations



Above is the reed indicator gage ready for work with some of the adjusting tools + + + + +

Below—The cover has been removed to show the indicating unit + +



ACCURACY of 0.00001 in. is said to be provided by the reed indicator gage, an electric gaging machine, recently placed on the market by the Sheffield Machine & Tool Co., Dayton, Ohio. An important feature is speed of gaging by virtue of signal light readings giving boundary line tolerances. Incidentally, this eliminates the human element involved in reading a scale.

In construction, an indicating lever travels between two contact points, which are adjustable from 0.00002 in. to 0.002 in. tolerance by means of the "scissors" at the back of the frame. Motion to the indicating lever is transmitted by parallel spring-steel reeds to which it is attached. These reeds are attached to two blocks, the right-hand block being secured to the frame, while the left-hand block is merely tied to the rigid block by two other spring-steel reeds. The movable block is held down against the plunger of the upper anvil by a fine coil-spring, and when work is placed under the anvil the block is forced upward, thus distorting the reeds which support the indicating lever and causing it to move from side to side. Normally, the coil-spring holds the movable block down and the indicating lever rests against the left-hand contact causing the green light (undersize) to burn; this light will continue to burn if the work is undersize. Should the work be correct, the lever will be moved to vertical, the green light goes out and the center, or amber light, flashes on. Should the work be oversize, the lever proceeds to the right and flashes the red light.

The small extension of the right-hand block over the lower part of the left-hand block acts as a safety stop and prevents damage to the gaging mechanism in case the head should be dropped on the column. Current used is 18 volts and a transformer similar to those used on electrical toys is provided.

Truck Tanks of Aluminum Eliminate Scale and Increase Pay-Load 24 Per Cent

Extra cost of aluminum tanks is absorbed in two-thirds of a year by the saving in dead load weight + + +

ABOUT two years ago, when *Automotive Industries* published an article on the use of aluminum for truck bodies, the question arose as to whether the light metal could be used safely for truck tanks for transporting gasoline, etc. Little information was obtainable at that time, as the experiment evidently had not yet been made. In the meantime, a number of gasoline truck and trailer tanks have been built of aluminum alloy, and mention of some of these is made in "Alcoa Aluminum for Truck Bodies," recently issued by the Aluminum Co. of America. The light metal seems to be even better adapted for use in truck tanks than for use in truck bodies intended for the transportation of solid, hard materials, for the reason that with a load of liquid there is less danger of local damage due to the greater softness of the aluminum sheet than where solids are being transported.

A tank truck operated by the Trackage Service Station of Milwaukee has a tank of Alcoa aluminum built by the Heil Co. of Milwaukee. In addition to the tank itself the underframe is made of aluminum, structural shapes being used for this purpose. The 1400-gal. aluminum tank weighs 2200 lb., and its capacity-load weighs 8680 lb. It is figured that the largest steel tank with which this truck could have been equipped without increasing the gross weight would have been 1200 gal. Hence the pay load was increased by 16.7 per cent. The additional cost of the aluminum tank, it is stated, was $1,000, and it is figured that the savings due to the transportation of less dead weight make up for this extra cost in two-thirds of a year. Other advantages claimed for the aluminum tank are that it does not scale on the inside, hence the gasoline will be kept cleaner, and by giving the outside of the tank a coating of clear lacquer, less heat is absorbed and loss by evaporation cut down.

The National Refining Co. operates a number of 750-gal. semi-trailer units, each of which weighs 11,035 lb. This size unit was duplicated in aluminum with the result that 1920 lb. of weight was eliminated, which is equivalent to more than 300 gal. of gasoline. The entire semi-trailer, with the exception of such parts as brake drums, brake rods, springs and axles, is made of aluminum alloy. The tank itself and such other parts as can racks, drop-panel side racks, drum carriers, piping, hose carriers and bolsters, were manufactured by the Davis Welding & Mfg. Co. of Cincinnati. The semi-trailer, which is of 110-in. wheelbase, was built by the Fruehauf Trailer Co. of Detroit, of aluminum alloy structural shapes and sheets. The weight reduction in this case permitted of the use of a lower-powered and lower-priced tractor, and this saving reduced the extra investment in the equipment to $850. Savings are expected from reduced operating and maintenance cost due to the use of a smaller tractor, increased tire mileage and reduced repainting cost.

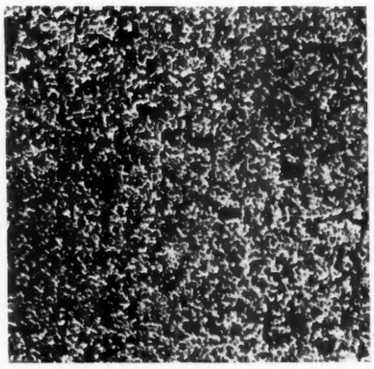
A very imposing-looking outfit for the transportation of gasoline, used by the Three D Distributors, Inc., of Fort Worth, Tex., consists of a Mack Model B-J three-quarter-ton tractor, hauling one 3325-gal. aluminum tank mounted on a Fruehauf six-wheeled trailer and one 2875-gal. aluminum tank mounted on a Fruehauf six-wheeled trailer. The train travels approximately 300 miles a day, between Electra and Fort Worth, Tex. The two tanks, which have a combined pay load of 6200 gal. of gasoline, were made by the Standard Steel Works of North Kansas City, Mo. It is estimated that the use of aluminum alloy in the tanks increased the pay load by 1200 gal., or 24 per cent.

CORRESPONDENCE in an English contemporary has drawn attention to the fact that since helium weighs twice as much as hydrogen, it is often erroneously assumed that a balloon when filled with helium will have only one-half the buoyancy as when filled with hydrogen. The buoyancy of a gas bag is proportional to the difference between the weight of a unit volume of air and that of a unit volume of the gas with which the bag is inflated, and since weights of equal volumes of different gases at the same pressure and temperature are proportional to their molecular weights, which are 2 and 4 respectively for hydrogen and helium, while the equivalent molecular weight of atmospheric air is 28.8, the loss in buoyancy when hydrogen is replaced by helium is only (100 x 2) / (28.8-2) = 7.5 per cent.

Self Oiling Material Developed by Amplex

A SELF-OILING bearing material called Oilite is now being produced by the Amplex Mfg. Co., a division of the Chrysler Corp. It is an alloy of copper, tin and other metals, which is impregnated with oil in a vacuum, absorbing as much as 40 per cent of its volume of oil. The high oil content of the bearing metal may be readily demonstrated. For instance, when the metal is squeezed in a vise, it will drip oil, and when it is left out in the sun, oil will seep out.

It is claimed for this new bearing material that it has greater strength than ordinary self-oiling bearing materials, which tends to eliminate breakage in assembly and also makes possible the use of the bearings where comparatively heavy loads must be carried. One of the most important uses of Oilite so far is in spring shackles. Several models of cars produced by divisions of the Chrysler Corp. are fitted with spring shackles having rubber bearings at the upper and Oilite at the lower end. A packing ring protects the shackle bearing against water and foreign matter.



Cross-section of an Oilite bearing magnified 100 times. The dark areas represent oil filling spaces between crystals of the bearing metal + +

Another important application is on the horizontal shaft of the steering gear, where high pressures and severe shock loads must be withstood. The material is used also for the water pump front and rear bearings, the clutch pilot and several other bearings of Chrysler, Dodge, De Soto and Plymouth cars.

Books for the Business Bookshelf

Researches in the Field of Engineering

Untersuchungen an der Dieselmaschine, der Spuel und Ladevorgang bei Zweitacktmaschinen (Diesel Engine Investigations, the Scavenging and Charging Process in Two-Cycle Engines), by Professor Dr.-Ing. Kurt Neumann.

Das Arbeitsverfahren Rasch-laufender Zweitakt-Vergasermaschinen (The Working Process of High-Speed Two-Cycle Carburetor Engines), by Dr.-Ing. Otto Kluesener. Published by V. D. I. Verlag, Berlin, Germany.

THIS is Report No. 334 on Researches in the Field of Engineering, published by the German Society of Engineers. As both papers deal with closely related subjects, the phenomena of gaseous flow in two-cycle engines, in Diesel and carburetor-type engines respectively, they have been combined in a single publication. Both authors present a theoretical mathematical discussion and the results of an experimental investigation of the subjects covered by them. Dr. Neumann's tests were made on a single-cylinder vertical Junkers Diesel engine with two pistons in the same cylinder, the engine having a maximum speed of 1000 r.p.m.; Dr. Kluesener's tests on a stationary DKW two-cycle carburetor engine. One of the conclusions drawn by Dr. Neumann is that the smaller the amount of scavenging air used the lower the efficiency of the scavenging process, but the higher the temperature (at the end of the scavenging process) of the charge of air introduced into the cylinder by scavenging. In order to obtain a high indicated mean pressure it is necessary to get a large amount of air into the cylinder, and from this point of view the cooling effect of the scavenging air is as important as the evacuation of burnt gases.

The DKW two-cycle carburetor-type engine tested by Dr. Kluesener was run at speeds up to 3500 r.p.m. Results of both series of tests are given in the form of tables and curves.

Economic Analysis of Industrial Problems

Economic Control of Engineering and Manufacturing Co., Inc., 402 pp., 84 figs., $4.

WITH the evergrowing importance of the economic analysis of industrial problems there is a definite field for a book of this type, pointing out as it does, the general problems of engineering and manufacturing whose solution depends upon economic analysis. The author, who is professor of mechanical engineering at Columbia University and a contributor to current trade press literature, is well qualified to handle the subject. His method is to single out the representative problems and then show how they may be analyzed and solved.

Some of the topics are: production planning, equipment—selection and purchase, economic aspects of materials handling, and engineering for manufacture. Probably the most striking thing about this book is the wealth of practical material drawn directly from current trade literature and papers read before the engineering societies.

Detonation in Carburetor-Type Engines

Research Bulletin No. 340 of the German Society of Engineers (Untersuchungen ueber das Klopfen von Vergasermotoren, by Dr.-Ing. Ludwig Auer) deals with investigations concerning detonation in carburetor-type engines.

IT is divided into two parts, the first being a review of the earlier literature of the subject, and the second a record of the author's own experimental work and theoretical deductions. The tests described were made with a new type of knock-tester which indicates not only the intensity but also the timing of the knock. The bulletin is published by V. D. I. Verlag, Berlin NW7, Germany.

GROWTH OF GRAY IRON

Dissociation of cementite into ferrite and graphite during annealing is the primary cause of an increase in volume

AN investigation of the causes of growth in cast iron has been made by F. Wuest and O. Leihner of the German Instute of Ferrous Research and is reported on in *Stahl und Eisen*. The authors distinguish between two causes. The first is the dissociation of cementite into ferrite and graphite in the course of the annealing operation, this dissociation resulting in an increase in volume. Aside from this first phenomenon, which is designated as the primary cause of growth, oxidation of the elements of the structure by the oxygen of the atmosphere or by oxidizing gases penetrating into the metal along the graphite flakes or, later, through fine fissures, also results in an increase in volume. In order to separate the effects due to each of these two phenomena, tests were undertaken of which a first series was carried out in a neutral atmosphere and the second in an oxidizing atmosphere. To eliminate other secondary actions, such, for instance, as the influence of the phenomena of transformation above the perlitic point, as well as the influence of addition elements, a great variety of compositions were selected for the test pieces, but they did not contain any special elements, and an annealing temperature of 1112 deg. Fahr. was used. The test pieces, moreover, were inspected after a certain number of anneals from the standpoints of modification in the composition and in the structure.

For the test in neutral atmospheres, 41 cast-iron test pieces were used, without any special elements, and of the most varied chemical compositions. These test specimens were subjected to 50 anneals of 12 hours' duration each. Cooling after each anneal lasted from six to seven hours. The increases in volume obtained varied between 0.03 and 4.5 per cent.

Theoretical Growth Exceeded by Actual Growth

Calculation showed that dissociation of cementite alone would not account for the growth in a neutral atmosphere. By analysis a diminution in the combined carbon was established. The increase in volume corresponding to this diminution in combined carbon was determined, and it was found that this "theoretical growth" was exceeded by the actual growth of each specimen.

The difference in the behavior of the different specimens with respect to growth may not be explained solely by the chemical composition. The composition, no doubt, exerts a certain influence, and this influence must be in the direction of the results of previous investigations, according to which a high silicon content accelerates growth, while a high manganese content retards it. These influences, however, are surpassed by others of greater importance.

Of predominant importance is the development of graphite, as has been pointed out by E. Piwowarsky; the finer and shorter the veins of graphite, the less the proportional expansion. The fact that test pieces obtained from the center and the outside of the same ingot (the chemical compositions of which must be the same, if one disregards differences in graphite content) grow entirely differently, shows very plainly that there are other factors overshadowing that of chemical composition. The same as the preceding observation, this fact draws attention to the relation between the metallurgical origin of the cast iron and its growth.

Location of Decomposition in Ingot

Curves of decomposition of cementite, that is, of "theoretical growth," showed a similar form, but the differences between center and outside were much smaller, so that the dissociation of cementite cut less of a figure than the location in the ingot from which the specimen was taken.

The authors reached the conclusion that the unknown factor which controls growth beyond the theoretical amount and which may also be related to the dissociation of cementite, must be looked for in the gas content of the iron. For that reason the test specimens which had shown the greatest growth in the principal test were remelted in vacuum. Then, under the same test conditions, these test specimens showed a ratio of growth which did not exceed the theoretical value, based on the dissociation of cementite. Other specimens of this check test were later annealed in vacuum for 55 hours at 840 deg. Fahr., which resulted in a considerable decrease in the rate of growth, but not down to the theoretical value.

In the tests in oxidizing atmospheres the specimens were subjected to superheated steam for 5182 hours, the steam being at 285 lb. pressure and at 626 deg. Fahr. Notwithstanding the long period of exposure to the heat, the growth figures were considerably lower than in the case of exposure to neutral atmospheres. This shows the importance of the temperature from the viewpoint of growth.

In these tests also it was impossible to establish

a relation between growth and chemical composition. As a rule, the rate of growth was the greatest for those specimens which had also shown the greatest growth when annealed in a neutral atmosphere. Specimens containing long graphite veins connected together in this case also showed more growth than those in which the graphite appeared in the form of short veins.

It was confirmed again that specimens taken from the center of the ingot developed greater growth than those from the outer portions. While dissociation of cementite is quite slow at temperatures of about 575 deg. Fahr., and therefore takes only a small part in the growth of the test specimen, the principal cause of growth resides in the oxidation of elements of the structure by steam entering under great pressure along the graphite veins. For a prolonged treatment, particularly in superheated steam, the differences between the different portions of the ingot should show up even more strongly because, aside from the oxidizing action, dissociation of cementite and the gas content then produce a more accentuated growth, which increases the disaggregation of the metal. The latter therefore becomes more penetrable and its elements are more exposed to oxidation by the steam.

The Forum

Oil Cooling

Editor, AUTOMOTIVE INDUSTRIES:

In your issue of March 7, I notice some comments on statements regarding compression and oil temperatures made in W. R. Ramsaur's S.A.E. Annual Meeting paper on Oil Cooling and Oil Coolers, and I wish to contribute some observations on lubricating oil temperatures in the crankcase of a high-speed Diesel engine which I tested recently.

The six-cylinder engine in question, which operates on the Bosch-Acro system, has a bore of 4.33 and a stroke of 5.59 in.; its crankshaft is of 3½ in. diameter and its crankpins have a diameter of 3 in. The reciprocating weight is around 5 lb., and the compression ratio is 15.5 to 1. The engine runs smoothly, quietly, and without smoke in the exhaust, at all of the speeds mentioned. No oil cooler or filter is fitted, but a fine-mesh gauze and a couple of permanent magnets are provided at the bottom of the oil sump.

To assist in cooling the oil pan, the blasts from two electric fans were directed against it from underneath.

During the first days, when the engine was stiff, the oil temperature went up to between 210 and 220 deg. Fahr., when running on half load at 1600 r.p.m. After loosening up the bearings (which were rather tight to start with), the oil temperature remained at 210 deg. at 2000 r.p.m. and went up to 220 deg. at 2500 r.p.m.

Engine speed has a greater influence on crankcase oil temperature than anything else. Full load operation at low speed (1000 r.p.m.) which means high bearing pressures, does not heat the oil as much as idling at 2000 r.p.m. While an increase in the oil temperature reduces the friction, a rise from 180 to 200 deg. in the oil temperature does not make as much difference in this respect as the same change in the temperature of the cooling water.

Rapid heating up of the oil and the water is essential to good engine behavior. Little is gained by running oil above 185 deg. Fahr. The water temperature should be kept as high as possible.

HUGO MOREN.

Coil Springs for Suspension

Editor, AUTOMOTIVE INDUSTRIES:

Referring to the article by Thos. J. Fay in your issue of Feb. 7 (page 198), surely Mr. Fay must be referring to the method of applying the spring rather than to the spring itself. As regards "jiggle" of the platform or cross-type spring, what Mr. Fay no doubt refers to is horizontal instability, in which connection there never was any excuse for this type of spring, nor was there for the last quarter of the three-quarter elliptic, as much more flexibility than necessary could be obtained at will with the ordinary half-elliptic.

For obtaining maximum results, between the raw steel bar and the road, helical springs just have it all their own way when applied to independent wheel springing. Admittedly, however, their anchorage, or, rather, the anchorage of the wheel, as well as the vertical damping, must be correct.

"LOCOMOTOR."

Independent Springing

Editor, AUTOMOTIVE INDUSTRIES:

I am not so enthusiastic about independent springing as Mr. Heldt. With the systems described in his second, third and fifth articles, the rolling-axis is on ground level, which means that the feeling of stability (e.g. when taking corners) will be poor, unless the car is built excessively low and fitted with hard springs, two defects uncommon on American cars.

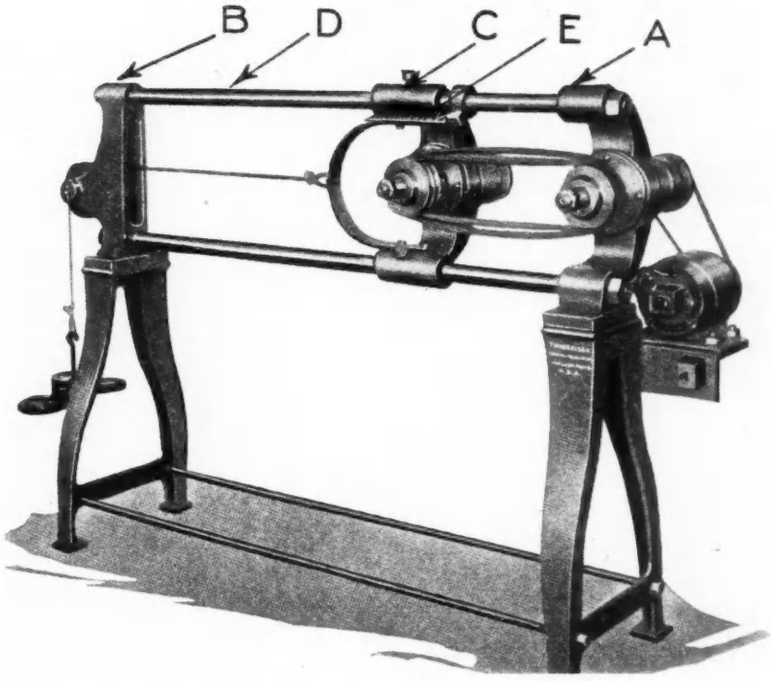
In Europe Bugatti, Horch and Voisin keep the spring level (i.e. the rolling-axis) high or raise it. Minerva and Panhard use a stabilator, which fixes the height of the axis at the rear independently of (higher than) the spring level. Tracta fits independent springing again only at the front on his latest model, and so on.

The swinging half-axles system, described in the fourth article, is quite different from the other systems and is free from this defect; the centre lines, around which the half-axles swing, fix the height of the rolling-axis.

All four systems avoid transverse jolts when the wheels on one side only of the car pass an obstacle or a depression.

A. VAN DER MEE, The Hague.

Norman Belt-Testing Machine Is Based on the Principle of Differential Drive



Belts tested on the Norman endurance belt-testing machine are subjected to all of the factors which influence their life in actual power transmission + + + + + +

A NEW machine for rapidly making tests of belts, known as the Norman endurance belt-test-machine, has been placed on the market by the Tinius Olsen Testing Machine Co. of Philadelphia. It is the invention of Prof. C. A. Norman of Ohio State University and is based on the principle of the differential drive, which is being used extensively in making tests of toothed gears. As shown by the illustration, reproduced herewith, the machine comprises two frames, *A* and *B*, and a sliding frame *C* carried on guides *D* supported by frames *A* and *B*. There are two horizontal shafts mounted in ball bearings, one on the stationary frame *A* and the other on the movable frame *C*. That on the stationary frame is driven by belt from a small electric motor. Two pulleys of slightly different diameter are keyed side by side on each shaft, the larger pulley on the first shaft driving the smaller pulley on the second shaft, and the larger pulley on the second shaft driving back to a smaller pulley on the first shaft. The two larger pulleys are of the same diameter, which also holds for the smaller pulleys. There is, of course, only a small difference between the diameters of the large and small pulleys, and this can be varied to meet different requirements.

With a pair of belts over these pulleys, one belt constitutes a speed-up and the other a speed-down drive, with the results that one will be tight at the top and the other at the bottom. The belts are pulled tight by a wire rope fastened to the sliding frame *C* and running over a guide pulley mounted on frame *B*. Dead weights of the desired amount are suspended from the end of the wire rope. The pull of this load is taken up by the tight sides of the belts, one side of each belt being quite slack. The tension difference or effective pull is substantially equal to one-half the dead weight. By adjusting the difference in pulley diameters, the slip in the belts can be varied at will. It is always equal to the percentage difference in pulley diameters.

Belts running in this machine are subjected to all the factors which influence their life in actual power transmission—the slip which causes surface wear and heating; the flexing over the pulleys which causes internal strains and wear; and the tension difference between the slack and tight side which causes a "fatigue" effect and leads to stretching and internal disarrangements.

The power consumed by the belts under test is only the power corresponding to the losses in an actual power transmission and the machinery for power take-off is entirely eliminated. Accelerated life tests can be made on this machine by increasing the dead weight so as to increase the tension on the belt, and, if necessary, by increasing the proportional difference between pulley diameters.

Among the advantages claimed for this machine are that it eliminates costly and complicated machinery, reduces the power consumed to a minimum, eliminates the need for power absorbing equipment, assures accuracy and saves time.

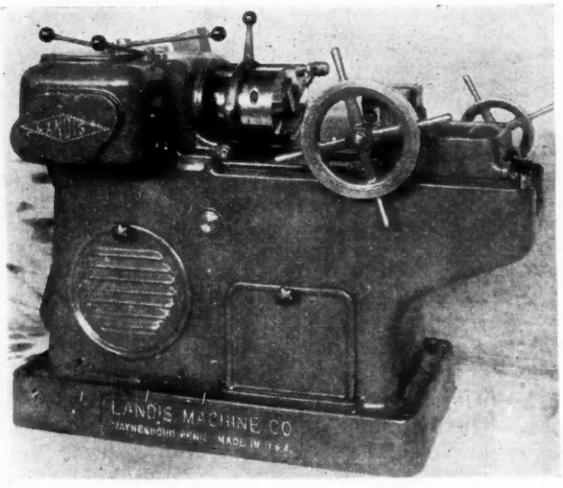
NEW DEVELOPMENTS—AUTOMOTIVE

Landis Threading Machines

THE Landis Machine Co., Inc., Waynesboro, Pa., has placed on the market a newly designed threader known as the Landmaco threading machine. It is made in the single and double head models and equipped with heat treated and ground Lanco heads. The machine has a single pulley drive with an adjustable friction clutch which is mounted on the outer end of the main driveshaft and readily accessible.

The gearbox is of the selective type and has eight speeds, thus making possible the use of an efficient threading speed on all materials and for all diameters within the capacity of the machine. The gearbox is integral with the headstock and is fitted throughout with anti-friction bearings. Speed changes are effected through levers which are conveniently located and easily operated. The bearings and all gears are lubricated automatically by a flood system of lubrication.

The double head machines, when equipped with lead screws, have a reversing mechanism in the gearbox for reversing one spindle. This mechanism can be supplied with the non-lead screw machines.



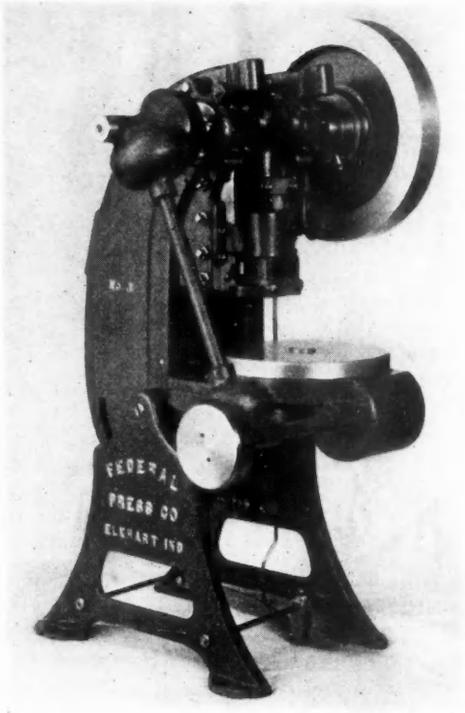
The die head is placed close to the front spindle bearing to reduce the overhang to a minimum. It is opened through a yoke by the forward movement of the carriage and is closed as the carriage is withdrawn. The yoke also has a lever by which the die head may be opened or closed by hand.

The carriage is gibbed and is operated either by a rack and pinion or a lever. The guides are completely protected by guards and wipers and are lubricated automatically by felt pads which are located in the base of the carriage and are fed from a central oil reservoir.

The vise has a horizontal sidewise, as well as a vertical, adjustment. This is a distinctive feature of Landis machines and makes possible an accurate alignment between the die head and the work. The heavy rim of the vise hand wheel acts as a flywheel and reduces the effort required to grip the work.

Federal Dial Feed Mechanism

USERS of punch presses and other equipment where dial feeds may be used, will be interested in the new dial feed mechanism (patents applied for) recently placed on the market by the Federal Press Co., Elkhart, Ind.



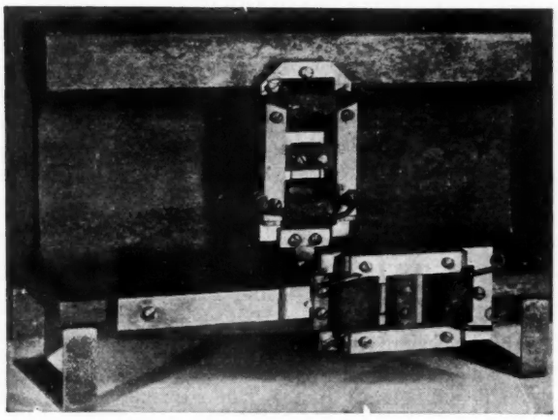
This attachment embodies a new principle in indexing. It is actuated from the crankshaft through two sets of bevel gears and a cam under the dial plate. This cam engages with hardened rollers attached to bottom side of dial, so that revolution of the crankshaft rotates the dial 1/12. The same cam that actuates the movement of the dial plate also locks the dial positively in place, making it impossible for the dial to skid by. This is accomplished by the indexing cam passing through between the rollers on the bottom of the dial.

On some operations on a dial it has been necessary to use lower kickout mechanisms to eject the pieces from the plate. With the Federal the kickout is actuated from the camshaft in the case beneath the dial. This mechanism can be mounted on any make of press.

PARTS, ACCESSORIES AND PRODUCTION TOOLS

Westinghouse Strain Gage

A MAGNETIC strain gage under development by the Westinghouse Electric & Mfg. Co. was exhibited at the recent annual meeting of the American Society of Civil Engineers in New York, by Brian Wheeler. The gage, which is illustrated herewith, is about 8 in. long and has bolt holes in its ends. The center section contains two coils of wire which carry electric current. A moving armature is adjustable within narrow limits; its movement varies the width of the air gap across which the magnetic flux must pass from the pole pieces to the armature. Three wires carry the current through the gage and either to a recording instrument or to an oscillograph, where readings can be made and photographs taken if desired. Any strains in the part to which the gage is attached cause a change in the width of the air gap between pole pieces and armature; this in turn produces an unbalance of the voltages in the circuits of the gage, and the degree of unbalance is indicated or recorded by electrical instruments or the oscillograph.

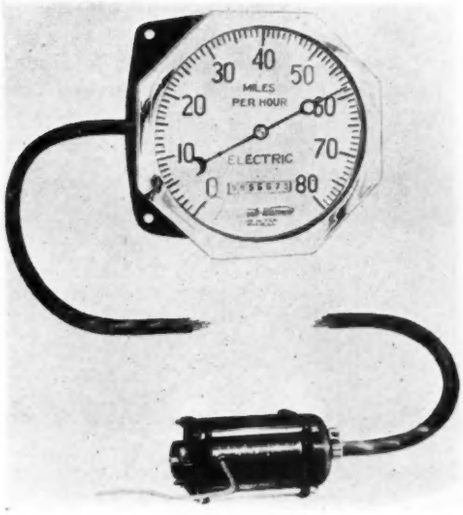


Westinghouse strain gage shown attached to rail so as to measure the strain in both the top and bottom parts when a train passes

Stewart-Warner Electric Speedometer

A NEW electric speedometer, which requires no mechanical connection with the propeller shaft or other chassis rotating part has been developed by the Stewart-Warner Corp. The usual flexible driveshaft is replaced by a six-wire electric cable which extends from a "converter" mounted close to a suitable rotating part. It appears that the new speedometer was developed particularly for use on motor buses, to eliminate the troubles ordinarily caused by failures of the flexible shaft.

The converter may be assembled directly to the sleeve and driven gear of a Stewart-Warner heavy-duty type set of speedometer gears, provided the gears are of the proper ratio; or it may be connected to the shaft end of a Stewart-Warner heavy-duty adapter, if the bus is equipped with this.



The speedometer embodies an electric motor of special design, operating on battery current. The rotor of the motor rotates in synchronism with that of the converter. The face dial is 6 in. in diameter so that it can be read easily from quite a distance. The odometer has seven dials and will register a million miles. Tachometers of this type will also be made available for installations remote from the machines on which operating speed is to be shown.

AC Oil Filter

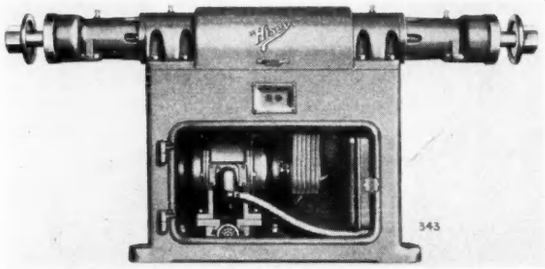
A NEW heavy-duty cleanable oil filter for buses and trucks has been introduced by AC Spark Plug Co. The filtering element can be taken out and cleaned by removing the cover. It is cleaned by washing the filter bag in gasoline. The new filter has been adopted by a large truck company and now is in production.

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

Hisey Texdrive Buffing and Polishing Machine

A LINE of heavy-duty polishing and buffing machines, featured by unit spindle head construction and Texdrive, has been added by the Hisey-Wolf Machine Co., Cincinnati, Ohio.

The motor is ball bearing equipped, mounted horizontally on a dovetailed sliding base and is adjusted by means of a hand wheel and feed screw. By this simple means it is said to be easy to secure proper belt tension and accurate alignment.

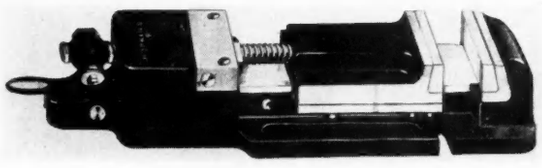


Wheel arbor ends are finished with flat top threads, affording greater security in holding buffing wheels, and fitted with a Tobin bronze safety wheel nut which protects the thread and the operator.

These machines are available in two sizes: 10 and 15 hp. Length of spindle, 82 in., overall. Net weight 2600 lb.

Hopkins Air-Operated Milling Machine Vise

AN air-operated vise combining the advantages of minimum height and high-speed operation has been added to the "Hopkins" line of the Tomkins-Johnson Co., Jackson, Mich. The special low construction is said to eliminate chatter and permit cutters to pass right over the vise. The



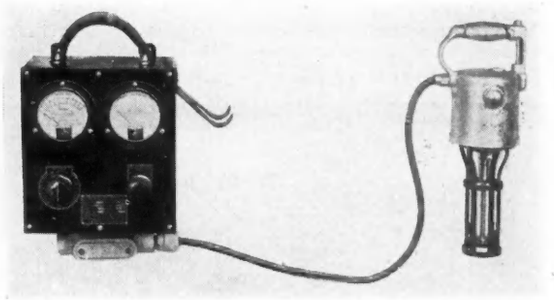
hardened jaws are removable to take special jaws suited to the work. Slots are provided for clamping and keys are fitted to assure correct alignment.

The base is 7 x 24⅝ in., width of jaw 6¼ in. Range in pressure 15,000 to 44,000 lb. with applied air line pressure from 30 to 80 lb.

DeVilbiss Electro-Viscometer

AN instantaneous electric viscosimeter for the rapid measurement of the viscosity of finishing materials, such as paints, varnishes, lacquers and oils, has been developed by the DeVilbiss Co. of Toledo, Ohio. The viscosity of the liquid is indicated on an open scale.

It has often been pointed out that faulty spray jobs, showing poor atomization, orange peel, dusty work, sags, etc., can often be accounted for by inaccurate thinning or viscosity control. For the instrument here illustrated, it is claimed that it measures the viscosity of the finishing material in the plant to an accuracy of plus and minus 2 per cent.



The instrument comprises an impeller which is rotated in the liquid under standard conditions by electric means. As the viscosity increases, the torque required by the impeller increases, and in an electric motor the torque varies with the current consumed, hence the current flow is a measure of the viscosity of the liquid being tested. The scale used with the instrument is substantially proportional to the logarithm of the absolute viscosity of the liquid, as long as the density of the liquid remains the same. Calibration charts have been prepared which permit of the ready conversion of DeVilbiss units into other units of viscosity, such as Saybolt seconds and Engler degrees.

When measuring the viscosity of any liquid with a DeVilbiss electric viscosimeter, it is not necessary to change the liquid from one container to another. All measurements can easily be made in the original container. The liquid does not need to be transferred into the instrument. Instead, the instrument is introduced into the liquid in its original receptacle.

New Low-Priced Heavy Duty Work Bench

A HEAVY-DUTY steel work bench, at low price, is announced by Lyon Metal Products, Inc., Aurora, Ill. The top plate is one-piece 10-gage steel. Channel steel legs are rigidly braced and equipped with wide toe plates for fastening to the floor. End construction permits the use of additional benches (continuous rows) at a considerable saving, since only one set of legs is necessary to each intersection.

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

Tapley Safety Brake Tester

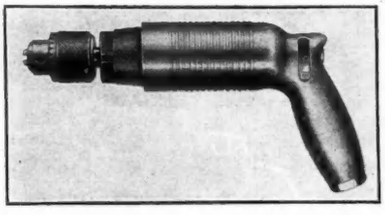
AN instrument designed to indicate whether any given predetermined rate of deceleration can be obtained with the braking system of a car has been placed on the market by the Burton-Rogers Co., Boston, Mass., under the name of the Tapley safety brake tester. The instrument comprises a small phosphor-bronze ball inclosed in a pivoted inclined tube. When the brakes are applied and the vehicle is slowed down in consequence, the kinetic energy causes the ball to roll up the inclined tube, to pass the pivot, and to tilt the tube, holding it in the registering position.

By means of a snap clamp at the back the instrument is easily applied to the dash of any car. The pointer at the left is first adjusted for the stopping distance in feet desired as a basis for the test, this being done while the car is standing on level ground or on the garage floor.

An orange-colored indicator marked OK is attached to the bottom of the tilting tube and will appear in the first or left window of the instrument if the retardation by the brakes is sufficient to stop the car in the distance for which the pointer has been set. A second tube with a green indicator attached at its bottom is also provided and is so arranged that it will appear in the window at the right when the brake retardation is approxmately 8 per cent more than that for which the pointer is set.

C-P No. 11 Midget Rotary Drill

A ¼-IN. PRODUCTION DRILL weighing only 3½ lb. is featured by the Chicago Pneumatic Tool Co., New York, N. Y. It is particularly well suited for drilling "tell tale" holes, for use in aeroplane and light metal construction such as metal casements, metal furniture and wherever light, rapid, accurate drilling is wanted. Note the "hand fit" design for ease of handling.



This drill is designed without pistons, crankshaft, valves or bushings, its chief feature being a "line drive" construction with the spindle in the center of the housing.

Paasche "Clamptight" Pressure Feed Tanks

PRESSURE feed tanks in six models, ranging from 3 gal. to 60-gal. capacity, suitable for use in refinishing shops as well as for quantity production, are announced by the Paasche Airbrush Co., Chicago, Ill. The "clamptight" feature eliminates the use of wrenches and is said to save considerable time in operation. The cover is clamped by means of an eccentric which holds it tight at 100-lb. pressure. Air is controlled by a 100-lb. air regulator and gage especially designed for heavy-duty air brush use. The phosphor diaphragm is compressed into position and is said to eliminate uneven temper, thus prolonging life and giving uniform regulation of air pressure continually. Material supply is strained by a special double vertical strainer preventing skin and chunks from clogging the paint line.

Gurney Clutch Throw-Out Ball Bearing

A CLUTCH throw-out ball bearing, which permits positive lubrication and which is specially recommended for use on taxicabs, trucks and buses, has been added to the line of the Gurney Ball Bearing Co., Jamestown, N. Y. Its outer ring has a wide flat surface on one side, on which the clutch throw-out arm or operating fingers may bear. Internally the bearing is similar to the regular radio-thrust bearing of the Gurney company.

This CTR clutch throw-out ball bearing is inclosed in a pressed steel casing incorporating a threaded nipple, and an extension pipe may be fitted into this nipple and extend outside the clutch housing, where a standard grease cup or lubrication fitting may be screwed into it.

Automotive Oddities—By Pete Keenan

STOP
ACCIDENT WESTCHESTER PARKWAY N.Y Aug. 1930.
WHEN A CERTAIN CAR IS TRAVELING 50 M.P.H. THE ENGINE TURNS UP 2070 R.P.M. WHEN SAME CAR IS TRAVELING 100 M.P.H., THE ENGINE TURNS UP NOT 4140, BUT ONLY 4090 R.P.M. — HOW COME?
Suggested by H.T. Ames Vice President of Duesenberg, Inc.
FLYIN' JACKASS "ORPHELIA" MASCOT OF LT. A.P. STORRS HAS 25,000 MILES IN AIR TO HER CREDIT.
CARS WASHED AUSTINS DUNKED
$1.00
25¢
SIGN ON THE BOSTON POST ROAD, Bridgeport, Conn.
BURRO HILL CONQUERED AT LAST.
This great 7 mile natural barrier resisted all attempts to cross Mexico, North to South. Recently the Auto Club of S. California, sent 3 Trucks across. It required the aid of 30 men and elaborate tackle. Trenches were dug to hold the wheels, The trail was widened, but cables were necessary to hold the trucks on the trail.
Pete Keenan

NEWS OF THE INDUSTRY

February Sales Fail to Hit Seasonal Top

Gained 8 Per Cent Over January, But Less Than Normal Expansion

PHILADELPHIA, April 2—Although passenger car sales showed a gain of about 8 per cent in February over January, the increase was slightly less than the normal seasonal expansion. As a result, after making the seasonal correction, February sales were on a somewhat lower level than in the first month of the year.

On the basis of 43 states, February registrations of new passenger cars amounted to about 136,000, as compared with 126,000 in January and 212,000 in February, 1930. The drop from last year amounts to 36 per cent. In this group of states, Ford shows a loss of 55 per cent in February from last year, Chevrolet a drop of 28 per cent, and all other makes combined a loss of 23 per cent.

Chevrolet again ran ahead of Ford, on the basis of returns for these states, with about 3 per cent more registrations. This makes the third successive month that Chevrolet has occupied first place in passenger car registrations.

Offers Jalbert Engine Rights

CHICAGO, April 1—George Cressaty, French patent broker and representative of the inventor of the Jalbert heavy-oil engine described on pages 548-9 of this issue of *Automotive Industries*, is now in this country negotiating with a number of American manufacturers with a view to selling rights to the engine. Mr. Cressaty may be reached in care of the Edwards & Bradford Lumber Co., Chicago. Announcement respecting the disposition of the American rights to the engine is expected shortly from Mr. Cressaty.

Willys Ends Retail Branches

NEW YORK, April 2—Willys-Overland, Inc., concluded its plan to retire entirely from the retail business and sell only through dealers by discontinuing retail sales today at the factory-owned store, Fiftieth Street and Broadway.

The News Trailer

By Herbert Hosking

John R. Wilde, chief engineer of the power plants of the **Detroit Edison Co.,** died March 30. Mr. Wilde gave **Henry Ford** his first job, after the latter had finished his apprenticeship as a machinist at the **Drydock Engine Works.** Here's how Mr. Ford tells about it in his **"My Life and Work,"** published in collaboration with **Samuel Crowther:** "Then I was offered a job with the **Detroit Electric Company** as an **engineer** and **machinist** at **forty-five dollars** a month. I took it because that was **more money** than the farm was bringing me, and I had decided to get away from farm life anyway . . ." Mr. Ford, you remember, had already been experimenting with the idea of a car. He set up a workshop near his home in Detroit, and completed the first car in 1892. "During all this time I **kept my position** with the electric company and gradually advanced to **chief engineer** at a salary of **one hundred** and **twenty-five** dollars a month. But my gas engine experiments were no more popular with the president of the company than my first mechanical leanings were with my father. It was not that my employer objected to experiments—only to **experiments** with a gas engine. I can still hear him say: 'Electricity, yes, that's the coming thing. But gas—no!' He had ample grounds for his **skepticism,** to use the mildest terms . . . I have the **dynamo** that I first had charge of at the **Detroit Edison Company.** . . . The Edison company **offered** me the general **superintendency** of the company, but only on **condition** that I would give up my **gas engine** and devote myself to something really **useful.** I chose the **automobile,** or rather I gave up the job—there was really nothing in the way of a choice. For already I knew that the **car** was **bound** to be a **success.** I **quit** my job on Aug. 15, 1899, and went into the automobile business." **Mr. Wilde** in effect, succeeded to the job which **Mr. Ford** had been offered. In 1913, nearly twenty years after Mr. Ford had quit the Detroit Edison Company—for better or for worse—Mr. Wilde became chief engineer of the powerplants. He had been chief engineer of the **Willis Avenue** plant shortly after his original contact with Mr. Ford.

March Total Output Placed at 187,848

Exceeded Rate of Nine Previous Months, N.A.C.C. Directors Learn at Meeting

NEW YORK, April 1—Motor vehicle output of manufacturers belonging to the National Automobile Chamber of Commerce in March topped levels for the nine preceding months, according to a preliminary report at the regular meeting of the organization's directors in New York today.

Estimates based on factory shipments place the March production of Chamber members at 187,848 units, an increase of 26 per cent over February.

The quarterly production for the companies included in the Chamber's estimate would amount to 465,884 units. In announcing the production estimate it was explained that complete figures for all manufacturers are not yet available.

Designated as official delegates of the Automobile Chamber to the International Chamber of Commerce meeting to be held in Washington the week of May 4, were: Roy D. Chapin, chairman of the board, Hudson Motor Car Co.; Robert C. Graham, vice-president, Graham-Paige Motors Corp.; J. D. Mooney, president, General Motors Export Co.; Ledyard Mitchell, vice-president, Chrysler Corp., and A. J. Brosseau, president, Mack Trucks, Inc.

It was also announced that the next meeting of the Automobile Chamber Board of Directors would be held in Washington during the same week.

Materials' Index Rises

NEW YORK, April 2—The index of automotive raw material prices, effective as of the middle of March, stood at 97, reflecting the first rise in a period of many months, according to the figures compiled for *Automotive Industries* by Ray B. Prescott. In the middle of February the index stood at 96, and in March, 1930, it stood at 116, according to Mr. Prescott. The Bradstreet index of general raw material prices stood at 103 for March, 1931.

Graham Produces 2064

DETROIT, April 1—Graham-Paige March production was 2064, while shipments amounted to 2300.

Hudson Sales Increase

DETROIT, April 1—Hudson's March sales increased more than 38 per cent over February.

Jordan Announces New Merchandising Alliance

Locomotive Engineers May Promote Its Car

CLEVELAND, April 2—Organization of the Jordan Motors Corp. to take over under contract the outstanding stock of the Jordan Motor Car Co., has been announced by Edward S. Jordan, who remains as president of the new company, and the bankers and organizers associated with him in the new project. The new corporation has formed a buying alliance with another automobile manufacturer, and will use some of the parts of this manufacturer in the construction of the new Jordan, which will be made in a medium-price class.

A feature of the present announcement is the formation of a good-will alliance with the Brotherhood of Locomotive Engineers, under which the Brotherhood will be offered a five-year option on 30,000 shares of the 500,000 of $10 par value which have been authorized by the new corporation. The Brotherhood is under no obligation to buy the stock, but is offered the privilege in exchange for the good will of its members in promoting the sale of the car to be manufactured.

Of the new stock issue not more than 85,928 shares are to be used in exchange for present shares of the Jordan Motor Car Co., on the basis of 10 shares of the old common for one share of the new. The remaining approximate 214,000 shares are to be offered to the public and the Brotherhood membership at the uniform price of $10 per share.

The Brotherhood of Locomotive Engineers has a membership of 90,000, located in 2000 communities, according to the Jordan announcement, which indicates that exercise of the stock option will probably depend upon a rise in the market value of the shares. Acceptance of the Jordan plan is being undertaken by the Brotherhood because of the necessity of making additions to the treasury.

No officers except Mr. Jordan have been announced for the new company. Stock offering will be made to the public through William L. Davis & Co., Detroit and Cleveland investment house. Executive offices have been established in the Standard Trust Building, Cleveland, which closely adjoins the offices of the Brotherhood of Locomotive Engineers and those interested in the new corporation are proceeding with the work of organization.

Midland at 70 Per Cent

CLEVELAND, March 30—The Midland Steel Products Co., Cleveland, Ohio, is now operating at 70 per cent of capacity, according to announcement, for the month of March to date. This is 20 per cent greater than February and double the business of December.

Financial Notes

Kelsey-Hayes Wheel Corp. has declared regular quarterly dividend of $1.75 on Series WW, Series KH and preferred stocks, respectively, all payable May 1 to holders of record April 20.

Link-Belt Co. has declared regular quarterly dividend of 60 cents on common stock, payable June 1 to holders of record May 15, and $1.62½ on preferred stock, payable April 1 to holders of record March 24.

Vickers, Ltd., will distribute to American deposited receipts, ordinary registered, 8 per cent, less taxes and expenses of depository, payable April 10 to holders of record March 24.

Ford Motor Iberia (Ford of Spain) has declared a dividend of 15 per cent on the capital stock. A year ago the dividend was 10 per cent. Net profits in 1930 were 6,030,000 pesetas, as compared with 4,859,000 in 1929.

Greenfield Tap and Die Corp. has omitted the quarterly dividend of $2 a share on the 8 per cent preferred stock, due at this time.

Parmelee Transportation Co. and subsidiaries in a pamphlet report for 1930 show net loss of $38,020, after all charges. This compares with net profit in 1929 of $1,305,408, equal after 6 per cent preferred dividend requirements and $55,686 equity for minority interest to $4.22 a share on common stock.

Federal Motor Truck Co. and subsidiaries report net profit for 1930 after all charges of $153,219. This is equivalent to 30 cents a share on capital stock, and compares with earnings of $502,190, or $1 a share, for the previous year.

Goodyear Tire & Rubber Co. has declared regular quarterly dividend of $1.75 on preferred stock, payable July 1 to holders of record June 1.

Kent Garage Investing Corp. has declared regular quarterly dividend of 50 cents on Class A common and $1.75 on prefered stock, both payable April 1 to holders of record March 15.

Cites Asiatic Growth

WASHINGTON, March 31—Although the continent of Asia possesses only 3 per cent of the motor vehicles in the world, its vehicle registrations have increased 3-4 times during the past five years, and the year 1930 increased 7 per cent, Ernest D. Cavenaugh, of the Automotive Division, Bureau of Foreign and Domestic Commerce, points out in an article on the Asiatic Automobile Market, which will appear in *Commerce Reports*, issue of April 13. The article reviews motor vehicle registration figures for the various territorial divisions of Asia, and cites the phenomenal growth in the registrations of trucks and buses, with the market for which the article principally concerns itself.

Battery Makers to Meet

TORONTO, March 30—Niagara Falls, Ont., will be the scene of the 1931 spring convention of the National Battery Manufacturers' Association which is to be held on April 23 and 24.

This convention is looked upon as being one of the most important held in recent years as matters of vital importance will come before the meetings. Present business conditions; the changes taking place in the battery industry; future trends, and many other subjects of special significance will be brought before the Niagara Falls convention.

Plans Summer Appraisal of Vaporlock Conditions

Bureau of Standards to Conduct Research

WASHINGTON, April 2—Study of vaporlock conditions in automotive engines will be made this summer by the Automotive Power Plant Section of the Bureau of Standards, H. K. Cummings, chief of the section, told *Automotive Industries* today. The study will be conducted by Dr. O. C. Bridgeman, research associate at the bureau, and is part of a program covering the relation of fuels and engines outlined by the Cooperative Fuels Research Committee, which is financed by the National Automobile Chamber of Commerce and the American Petroleum Institute, the funds being administered by the Society of Automotive Engineers.

The forthcoming study will supplement one made last summer. Temperature measurements were then made on different makes of cars, while the cars were driven through West Virginia mountains over a road with a uniform grade, approximately six miles in length. Results of the tests were reported at the S.A.E. annual meeting in Detroit last January. It has not been determined where the tests this summer will be made. Provided a course similar to that used last summer is made available by light travel, a route nearer to Washington will be used.

The tests last summer were made on more than 30 cars. It is planned this summer to take the latest models of the same makes and make further measurements in an effort to learn whether changes in designs have improved gasoline line temperatures and what further recommendations will be made to manufacturers.

Canadian Financing Drops

OTTAWA, March 30—The figures for automobile financing show a drop in January as compared with December of last year, and also indicate a falling off in financing as compared with the corresponding month (January) in 1930. The per cent of change is 23.3.

The total number of cars financed was 5023 in January, 1931; 6762 in December, 1930, and 5161 in January, 1930, and the amount of financing was $2,188,540 in January, 1931; $2,948,852 in December, 1930, and $2,852,995 in January, 1930.

New cars financed were 2227 in January, 1931; 1316 in December, 1930, and 1335 in January, 1930; while used cars financed were 2796 in January, 1931; 5446 in December, 1930, and 3826 in January, 1930.

Financing of new cars amounted to $904,850 in January, 1931; $608,543 in December, 1930, and $1,113,471 in January, 1930. Financing of used cars amounted to $1,283,690 in January, 1931, $2,340,309 in December, 1930, and $1,739,524 in January, 1930.

Knute Rockne Killed; Held Studebaker Post

Famous Coach Dies in Airplane Accident

PHILADELPHIA, April 1 — Last week *Automotive Industries* carried an announcement that Knute Rockne, famous Notre Dame football coach, had been appointed manager of sales promotion activities for the Studebaker Corp. Yesterday the news came that Mr. Rockne had been killed in an airplane accident, while flying to keep a motion picture engagement on the west coast. Hundreds of Mr. Rockne's newer acquaintances were made during the last New York National Automobile Show, when in addition to speaking at the Studebaker banquet, he appeared on the program of the preshow dinner of the Automobile Merchants' Association of New York, and at the annual banquet of the Society of Automotive Engineers.

Informed of Mr. Rockne's death, Paul G. Hoffman, vice-president in charge of sales of the Studebaker Corp., telegraphed the following statement:

"Studebaker has relied upon Knute Rockne for the past three years to enthuse and inspire its selling forces. Every Studebaker man will testify that he has handled his assignment superbly. Recently the scope of Rockne's work was enlarged and he was put in charge of sales promotion and training.

"He had embarked upon his new duties with characteristic vigor and determination. He was so tremendously alive and dynamic that it is difficult to realize that he has gone. All Studebaker men feel his loss keenly, but I hope we have caught something of his fine spirit and buoyant personality that will endure in the organization from now on."

Essex Adds Big Sedan

DETROIT, March 31 — The Hudson Motor Car Co. has introduced a seven-passenger sedan type on the Essex chassis. It is priced at $895. This is believed to be the lowest figure at which a seven-passenger sedan has been offered. Auxiliary seats, which fold flush with the back of the front seat when not in use, provide for seating of two passengers. Upholstery in the new Essex seven-passenger sedan is of plush mohair.

J. B. Darlington Co. Formed

NEW YORK, March 30—J. B. Darlington Manufacturing Co. has been incorporated in Delaware with a capital of $100,000 to manufacture automobile headlights and equipment. The company has its headquarters at Pittsburgh, Pa., and is headed by J. B. Darlington, president; Paul E. Schmeling, who is vice-president and treasurer, and O. R. Galovich, who is secretary.

Six-Point Suspension

American Chain Co., Inc., has announced that American Cable Co., a subsidiary, has concluded negotiations for the manufacture of preformed wire rope under a license agreement from the American Steel & Wire Co. Freedom from torsional stress is claimed for the preformed products.

Total national wealth of the United States in 1929 amounted to 361.8 billion dollars. The national income for the same year was $84,000,000,000, according to estimates of the National Industrial Conference Board. The per capita wealth under this figure is $2,977 and the per capita income was $692. The most recent United States census estimate of national wealth was 320.8 billion dollars for the year 1922.

The Mead Johnston water-rail-truck terminal in Evansville, Ind., is expected to facilitate shipping of automobiles from factories in the middle west to dealers in the Ohio and Mississippi Valley markets. The new terminal has a capacity for handling one million tons of freight yearly. Loading facilities between barges, rails and trucks are provided.

Ford Motor Co. has placed in service its new tunnel connecting the Dearborn plant with a branch of the Detroit River. The tunnel is 15 ft. in diameter and two miles long and has a capacity of 913,600,000 gal. daily. The tunnel is part of a program for increasing the output of the Ford Motor Company's power plant. With the installation of two new high-pressure boiler units, the power plant will have a capacity of 230,000 kw., an increase of 86,000 kw.

The Austrian Gasoline Cartel has reduced retail prices on gasoline to 20 cents a gallon in Vienna—a decrease of 5 per cent, according to a report from the Department of Commerce.

Midwest Engineering Works is now located in its new quarters at 5948 South Western Ave., Chicago.

Lincoln Electric Co., Cleveland, Ohio, has moved its Chicago office to a new building at 1455 W. 37th St. from 53 W. Jackson Blvd.

Century Air Line, new Cord subsidiary, carried 163 paid passengers on the opening day, March 23, according to L. B. Manning, vice-president and general manager.

Hupp Motor Car Corp. is equipping a number of its demonstration cars with engine revolution counters which are used to indicate the difference in the number of engine revolutions over a given course with and without the use of free wheeling.

Federal-Mogul Corp. has again been awarded the Inter Safety Contest Trophy offered twice yearly by the Detroit Industrial Safety Council. The contest is based on the frequency and severity of accidents over a period of six months.

The Monighan Mfg. Co. has changed its name to Bucyrus Monighan Co., according to the Secretary of State of Illinois.

Bureau of Standards, Division of Simplified Practice, has mailed to interested parties a report of the Second Division Conference on Simplified Practice Recommendations No. 17 covering forged tools. The second revision, if accepted by the industry, is to become effective July 1.

Ohio Seamless Tube Co., Shelby, Ohio, has moved its western office to 1225 W. Washington Blvd., Chicago.

The World-Herald, a newspaper in Omaha, Neb., has begun an advertising campaign built around the slogan "Enjoy your car with pride," which will occupy a page weekly for a six months period. The campaign is to be devoted entirely to the promotion of increased care and upkeep of the automobile.

A Willys Six, Model 97 club sedan recently established a new record for the climb up Mt. Baldy, Calif. The distance of 7.1 miles was made in 10 min., 5 2/5 sec., clipping 38 3/5 sec. off the former record. The test was under AAA supervision.

Amtorg Trading Corp. has completed a shipment of 29,963 American tractors to various Russian ports.

Kinner Airplane & Motor Corp., Glendale, Calif., has announced that under certain conditions the Kinner K-5, 100-hp. engine may be substituted for the OX-5 engine with the approval of the Aeronautics Branch, Department of Commerce. Conversion may be made on the Alexander Eaglerock, American Eagle, Bird, Swallow or Travelair planes with the installation of Kinner engine mounts and cowling.

Reo Announces Another "Royale"

Will Be Shorter Than Present Leader of Line

LANSING, April 2 — Announcement of a new model Reo Royale, to be known as the 8-31, was made Wednesday, April 1, by William Robert Wilson, vice-president and general manager of the Reo Motor Car Co. The new car will be similar in design to the Model 8-35, leader of the Reo line. The wheelbase of the new model is 4 in. shorter than the 135-in. base of the Reo Royale 8-35. The new line is priced at $2,145 f.o.b. Lansing for the standard sedan, victoria and coupe, which compares with $2,745 for the 8-35 models. De luxe models with wire wheels are available at extra cost.

The 125 hp. Reo-built nine-bearing engine, the double-plate 10-in. clutch and herringbone gearshift, silent second transmission, the axles, steering gear and springs used in the 8-35 are found in the new model. The same type of vee-pointed chrome-trimmed radiator and sweeping aerodynamic body lines are found in the 8-31. The new car is equipped with shatter-proof windshield, adjustable inside sun visors, adjustable front seat and steering column, twin windshield wipers, automatic controlled dome lights and other features. The new model is now in production.

Speed Records Confirmed

PHILADELPHIA, March 31—Confirmation of the world's land speed record established Feb. 5 at Daytona Beach by Captain Sir Malcolm Campbell has been received from the Association Internationale des Automobile-Clubs Reconnu, which has officially set the record at 246.09 m.p.h. for the kilometre course, and 245.73 m.p.h. for the mile course.

The Class H records set Feb. 16 by G. E. T. Eyston, whose M. G. Midget was pictured in the news section of the last issue of *Automotive Industries*, have been confirmed as follows: 5 kil., 103.13 m.p.h.; 5 miles, 102.76 m.p.h.; 10 kil., 102.43 m.p.h., and 10 miles, 101.87 m.p.h. Class H records are for cars of 500 to 750 cc. displacement. All of Mr. Eyston's records were made with a flying start on the Montlhery track in France. They supersede records made Feb. 10 in the same car.

De Soto Engine Smoother

DETROIT, March 30—De Soto Sixes have recently been coming through with counterweighted crankshafts. Rather than wait for new model announcement time De Soto had added this feature to provide additional engine smoothness and longer life for bearings by reducing the bearing loads.

Plans Truck Pickup Service

CHICAGO, March 30—Pickup and delivery by motor truck of freight shipments moving by rail is to be provided by the Chicago, Milwaukee, St. Paul & Pacific Railroad, according to E. B. Finegan, freight traffic manager.

Steel Market Steady At Quarter Ending

Price Advance Movement Reduced in Importance

NEW YORK, April 2—Neither in volume nor character has the transition from the year's first to its second quarter brought any marked change in the automotive demand for steel products. Some finishing mills fare better than others in first half of April specifications, but on the whole there does not seem to have been very much gain or loss in the rate at which business from motor car manufacturers and parts-makers is coming out.

Recently announced price advances have either not yet become operative or have fallen by the wayside. In the market for strip-steel, buyers' resistance has caused efforts to mark up second-quarter prices to be shelved. While the price for hot-rolled bars, according to recent announcement of leading producers, was supposed to have changed on April 1 from 1.65 to 1.70c, Pittsburgh, current shipments to tonnage buyers are at the lower figure, and from all one hears, unless there should be an entirely unexpected bulge in the demand, the 1.65c price level will apply to tonnage business for some time to come. Of course, producers have gone on record as reserving to themselves the right to put price advances into effect without further notice, but much slack must be taken up before the moment will be ripe for such a procedure.

In sheets, buyers continue to have things very much their own way. Full-finished automobile sheets are quoted at 3.20, Pittsburgh, and black sheets can be bought in round lots at 2.25c, especially when extras for special finishes are entailed. Demand for wire products continues fair. Automotive alloy steels are fairly steady.

Pig Iron—Minor downward price readjustments in some of the pig iron markets have not resulted in any marked increase of forward buying, automotive foundries continuing to buy in moderate tonnages, but consistently so.

Aluminum—Somewhat improved buying of piston metal is noted. Secondary metal specialists also report more interest on the part of Detroit consumers. Prices are unchanged.

Copper—Custom smelters offered metal at 9¾c, delivered Connecticut, on Tuesday. Fabricators and wire drawers continued to base their prices on the 10c "official" producers' price.

Tin—A dictatorship over tin, embracing production, possession, sale, purchase, and export has been established by the Federated Malay States government, the chief secretary being given plenary authority without recourse to the courts on the part of objectors. Prices stiffened under the influence of this news from Singapore, the week's opening price for spot Straits being 26½c.

Lead—Nothing definite so far has come out of the conference of producers who met in London with a view to curtailing world production. The market is steady and unchanged.

Zinc—Dull and fairly steady.

Tabor Mfg. Co., Philadelphia, announces the opening of a sales office at 2842 West Grand Boulevard, Detroit.

Six-Point Suspension

Glenn L. Martin Motors Co. has announced that E. C. Burghduff, sales engineer, and F. Colston Young, sales representative, will fly to Detroit for the National Aircraft Show in the company's Waco, powered with a Martin 333, four-in-line motor.

Aeronautics Branch, Department of Commerce, has announced the appointment of Walter F. Parkin as chief of inspection service. Mr. Parkin was formerly an assistant chief of the inspection service located at Los Angeles. His connection with the branch dates from March 1, 1927, when he was appointed an inspector. Joseph S. Marriott has been appointed assistant chief of the inspection service.

Westinghouse Electric & Mfg. Co. announces that it has received a contract for the electrical work on the navy dirigible ZRN-4, now being manufactured by the Goodyear-Zeppelin Corp. at Akron.

Raybestos-Manhattan, Inc., in April will open a second brake school at Grand River and Sycamore Avenues, Detroit. The first unit of the school was started at Bridgeport, Conn., at the company's plant.

Exports of automobile casings during the month of February reached 121,484 units, valued at $952,712.

The Allsteel Press Co., 12015 S. Peoria Street, Chicago, has been organized to manufacture "Verson" allsteel punch presses, forging presses, etc. D. C. Verson is president.

Cadillac Motor Car Co. reports resumption of a 20-car driveaway three times a week to Chicago from the Cadillac plant in Detroit. This periodic activity is now in its seventh year.

Prest-O-Lite Storage Battery Corp. announces that J. H. McDuffee, vice-president, left the Indianapolis office of the company on March 17 for the Pacific coast, where he will accept delivery of the company's new airplane, a Lockheed-Vega, which has been christened the "Prest-O-Lite II." Before flying the ship back to Indianapolis, Mr. McDuffee will use it to visit Prest-O-Lite factory distributors in California.

A. B. Jenkins, racing driver, will attempt to break every American hill-climbing record of importance in a Studebaker President roadster. The attempt will be made under American Automobile Association supervision. The car will be transported from one point to another on a Studebaker two-ton truck, accompanied by Jenkins in his own roadster.

Billings & Spencer Co., Hartford, Conn., has announced the promotion of W. Roy Moore to the position of general manager. Mr. Moore has been with the company for seventeen years.

Graham-Paige Motors Corp. has announced that it will continue on the air with 13 additional Sunday evening programs over the Columbia broadcasting system. This follows a successful initial series of 13 concerts, which began Jan. 4. The same headliners will appear on the program.

Burrell Reduces Dividend

CHICAGO, April 1—Directors of Cherry-Burrell Corp. have placed the company's common stock on $1.50 annual basis as compared with former $2.50 rate by declaration of quarterly dividend of 37½ cents a share.

Stutz Prices New Complete Line

Dual Valve Series Includes Custom Types

INDIANAPOLIS, March 31 — The Stutz Motor Car Co. today announced the price listing of the new series DV, the 32-valve engine models. The horsepower of these engines has been announced as 148 at 3900 r.p.m. It also was explained that the full peak of the motor is not shown at this speed.

The models will be mounted on both 134½-in. wheelbase chassis and the 145-in. chassis. The prices range from $4,895 to $7,200, with popular models listing as follows:

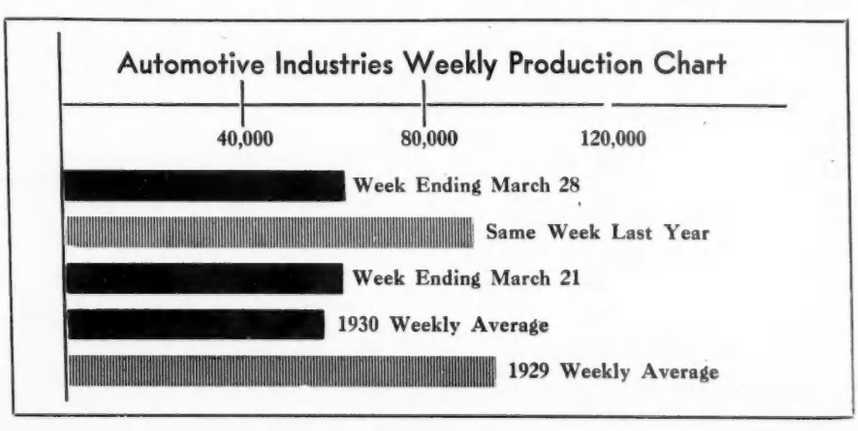
MODEL AND TYPE	PRICE*
DV 32 Stutz, 134½-in. Wheelbase	
5-pass. Sedan	$4,995
5-pass. Coupe	4,895
2-pass. Coupe	4,995
2-pass. Speedster	4,995
4-pass. Speedster	4,995
4-pass. Speedster, Tonneau Cowl	5,295
Cabriolet Coupe	5,095
Torpedo Speedster	5,095
Club Sedan	5,095
Production Chassis	4,195
DV 32 Stutz Custom—145-in. Wheelbase	
7-pass. Sedan	$5,395
7-pass. Limousine	5,495
5-pass. Convertible Sedan	5,895
7-pass Speedster	5,095
Cabriolet Coupe	5,495
5-pass. Sedan	5,395
Production Chassis	4,795
DV 32 Stutz Salon—145-in. Wheelbase	
LeBaron 5-pass. Sedan	$6,295
LeBaron 6-pass. Brougham	6.495
LeBaron 6-pass. Brougham Lim.	6,695
LeBaron 6-pass. Sedan	6,495
LeBaron 6-pass. Sedan-Limousine	6,695
LeBaron 7-pass. Sedan-Limousine	6,695
LeBaron 5-pass. Trans. Cab	7,110
LeBaron 7-pass. Trans. Town Car	7,200
Chateau Series Weymann DV 32 Stutz 134½-in. Wheelbase	
4-pass. Weyman Longchamps	$5,845
5-pass. Weymann Versailles	5,485
DV 32 Stutz, 145-in. Wheelbase	
5-pass. Weymann Chaumont	$6,245
5-pass. Weymann Monte Carlo	6,395

*Extra equipment prices same as on MB Stutz. Fleetwood, Brunn, Derham, Rollston and other custom bodies, prices on application, dependent upon specifications.

Illinois Sales Increase

CHICAGO, March 31—New automobile sales in Illinois took a healthy jump upward in March, according to figures from the Illinois Chamber of Commerce, listing March sales at 11,583 new cars, 1811 sales ahead of February and 2227 ahead of January.

The March figures mark the fourth straight month that sales have risen.



Australia Moves To Increase Duties

Automotive Items Named in Bill

WASHINGTON, April 2—Assembled and unassembled chassis, shock absorbers and carburetors are included in a long list of products on which import duty increases were introduced in the Australian Parliament on March 26. The increases became provisionally effective the following morning pending formal ratification, according to a radiogram received from Trade Commissioner Earl C. Squire, Sydney.

With respect to unassembled chassis, the general tariff rate, applicable to the United States, has been increased from 27½ per cent to 32½ per cent ad valorem. The intermediate rate, which applies to Canada, has been decreased from 22½ to 15 per cent, while the British preferential remains duty free. For assembled chassis the general rate has been raised from 60 to 67½ per cent, with the intermediate and British preferential duties unchanged at 52½ per cent and 7½ per cent respectively.

The general rate on shock absorbers has been increased to a specific rate of 37s 6d ($9.12) each, from 82½ per cent, while the rate on carburetors has been increased to 75s ($18.25) each, from £3 or $14.61.

Outboard Announces Lines

MILWAUKEE, April 2—Two complete lines of outboard marine engines have just been announced by the Outboard Motors Corp. for the 1931 season. The Evinrude line consists of nine models, ranging in power from 2¾ to 40 hp. and in price from $99.75 to $445. The Elto line comprises nine models in the same price range and with the same maximum and minimum hosepower. Magneto ignition is standard on the Evinrude line, with electric starting optional at an extra cost. Dry-battery ignition is standard on the Elto line, with the starter extra. There is a slight difference in the horsepower rating and price of various models in the two lines.

Shows New Taxi Coach

DETROIT, April 1—The taxi coach was given its first public showing today by the Twin Coach Co. The basic idea of the design is to impart passenger-car flexibility and increased comfort to motor coaches. The coach has three compartments with cross seats and individual door. The total passenger capacity is 17. It weighs under 8000 lb. and will be priced at around $6,000 to $6,500. The design includes remote fare collection from each seat. Brakes, doors, fare collection are operated by compressed air. The width of the vehicle is approximately the same as that of an ordinary large passenger car.

Reo Produces 1201

DETROIT, April 1—Reo Motor Car Co. produced 1201 units in March.

Willys Sales Increase

TOLEDO, April 1—Willys-Overland will boost schedule for April 25 per cent over March, according to George M. Graham, vice-president in charge of sales, who reported March sales were approximately 30 per cent over February, or double the first month.

Ford, Ltd., Forms New Holding Co.

Special to *Automotive Industries*

LONDON, March 31 (*by cable*)—Ford Motor Co. (England), Ltd., has transferred to a Luxembourg holding company, recently formed for the purpose, all its shares in all its Continental European subsidiaries, it was learned today. This was in line with the desire of the English company to pay a 10 per cent dividend on its own shares, out of its Insular profits, and to transfer to a surplus account all of its profits from operations of its Continental subsidiaries.

Under the present English law, an income tax of 22½ per cent is levied on corporate profits from all sources, whether they are distributed to shareholders or not. When dividends received by the holding company are required by the parent company, they are brought into its accounts as direct revenue.

Meanwhile funds accumulated by the holding company increase the capital value of its shares, all of which are held by the Ford Motor Co., Ltd. Under this arrangement a direct English tax on profits from the European subsidiaries is obviated, except when a portion of these profits is applied to the payment of dividends or other direct use by Ford Motor Co., Ltd.

Marmon Offers Free-Wheeling

INDIANAPOLIS, April 2—The Marmon Motor Car Co. today announced the adoption of the Studebaker type free wheeling for the 70 model of its line. The free-wheeling equipment will be optional equipment on this model, with an additional charge of approximately $35. The Marmon 70 is a straight eight of 84 hp., and is the lowest priced car in the line for 1931. Factory officials claim that this will make the Marmon 70 the lowest priced eight offering free wheeling. Extension of free wheeling throughout the line is being studied by factory executives.

Caterpillar Holders Reelect

CHICAGO, April 1—Stockholders of the Caterpillar Tractor Co. at their annual meeting yesterday reelected all retiring directors. Current rate of production at Peoria plant is virtually unchanged from recent levels. On account of the season in all developments, it is probable the rate of production may decline soon. Because of the steady demand for spare parts and requirements of shipping department, however, it is unlikely that the plant will completely shut down.

General Motors Reviews Its Year in Formal Report

Current Assets Decreased Slightly at End of 1930

NEW YORK, April 3—Pamphlet report of General Motors Corp., mailed to stockholders today, confirms the preliminary earnings figure for 1930 of $141,616,131 as compared with $248,282,268 for 1929. Dividends at the rate of $3 per share were paid during the year totaling $140,038,662 as compared with $166,078,688 in 1929.

Total current assets as of December 31 were $364,817,496 as compared with $368,960,945 in 1929. Net working capital was placed at $281,037,636 as compared with $251,287,782 at the end of the previous year.

Operating developments during the year, outside of the introduction of the Cadillac V-16 and V-12 and the model changes in the various General Motors lines, include the acquisition of the Winton Engine Co., Electromotive Co., the joint acquisition with E. I. du Pont de Nemours & Co. of Kinetic Chemicals, Inc., plant facilities and branch operations of Martin Parry Co., and the disposal of Jaxon Steel Products Division.

The number of stockholders at the end of the year was 263,528 as compared with 198,600 at the end of 1929, and with 2920 at the end of 1917.

Michigan Sales Rise

DETROIT, April 1—Michigan new passenger car registrations for February totaled 7417 cars, an increase of 1824 or 23 per cent over January total of 5993, and a decrease of 3925 or 33 per cent from previous February total of 11,742. Ford registration totaled 2976, 38 per cent of all makes and an increase of 1070 or approximately 36 per cent over Ford's January total, and a decrease of almost 51 per cent from the previous February total of 6068.

Chevrolet passenger car registrations totaled 1759 against 1679 in January and 2457 in February, last year. Oldsmobile comes third with 437, Pontiac fourth with 349 and Buick fifth with 321. The total commercial car registrations were 794, an increase of 27 over the total of 767 in January and a decrease of 450 or 36 per cent from February, 1930, total. Ford showed 448 as compared with 422 in January and 713 in February of last year. Chevrolet came second with 199, and International third with 42.

City Machine Reports Loss

TOLEDO, April 1—City Machine & Tool Co. reported loss of $50,891 after all charges to operations in 1930. The company had a gross profit of $69,019, set up depreciation of $42,023, and during the year paid to stockholders $239,700 in dividends.

Men of the Industry and What They Are Doing

Russell Heads Massey-Harris

T. A. Russell, acting president of Massey-Harris Co. for the past three months, has been appointed president, and B. W. Burtsell has been named general manager. Mr. Russell has been a member of the board of directors for several years and a year ago was elected vice-president. Mr. Burtsell leaves the Sargeant Lock Co., New Haven, Conn., to assume his new duties. Until 18 months ago and for ten years previously, he was vice-president and general manager of McKinnon Industries, Ltd., of St. Catherines, Ont. The firm has since been taken over by General Motors. Mr. Burtsell, prior to joining McKinnon industries, was factory manager of Packard Motor Car Co.

Air Associates Elect

Air Associates, Inc., has elected F. Leroy Hill, who has been vice-president and general manager since 1928, as president of the company. Haven B. Page, former treasurer, has been elected vice-president, and H. I. Crow, secretary and treasurer. James B. Taylor, Jr., who has been president since 1928, has resigned to devote his time to other activities.

Morse Names Appleton

F. C. Thompson, vice-president and general manager of Morse Chain Co., Ithaca, N. Y., and Detroit, subsidiary of Borg-Warner Corp., announces the appointment of R. W. Appleton as purchasing agent at Ithaca. Mr. Appleton was formerly director of purchases of the Pierce-Arrow Motor Car Co.

Timken Steel Names Wiewel

Walter H. Wiewel has been appointed sales manager of the Timken Steel & Tube Co., succeeding A. J. Sanford, resigned. Mr. Wiewel has been associated with the company for several years, in charge of sales in New York. His headquarters will now be in Canton.

Reeves on Radio Program

Alfred Reeves, general manager of the National Automobile Chamber of Commerce, will speak over the radio next Monday evening, April 6, as part of the General Motors hour program.

Chrysler Names Ten

The appointment of eight district managers and two acting district managers has been announced by J. W. Frazer, general sales manager of Chrysler Sales Corp.

The district managers will have charge of sales activities in their respective territories.

The appointments of district managers are: E. C. Suckow, Boston; H. B. Sewell, Charlotte; L. F. Johnston, Chicago; H. V. Ludlow, Cincinnati; B. C. Helm, Cleveland; F. A. Petrie, New York; J. B. Covell, Philadelphia, and F. S. McComb, Pittsburgh. The appointments of acting district managers are: C. E. Beloate, Atlanta, and F. D. Turrill, Minneapolis. Each of the newly appointed sales executives has been connected with Chrysler Sales Corp. for several years in various phases of sales work.

Eaton May Buy Reliance

MASSILLON, OHIO, March 31—Preliminary negotiations for acquisition of the Reliance Mfg. Co. by the Eaton Axle & Spring Co. have been concluded, officials have announced. A special meeting of Reliance stockholders has been called for April 20 to ratify the transaction.

W. H. Crawford, president of the Reliance Co., said that in view of the fact that the company's operations are confined almost exclusively to the manufacture of spring lock washers, that the merger was to bring about eventually a diversifying of the company's products.

Combined assets of Eaton Axle and of Reliance makers of lock washers are approximately $20,000,000.

Timken Roller Reports

CANTON, OHIO, March 31—Net earnings of the Timken Roller Bearing Co. after deduction of reserves for depreciation charges and income taxes, amounted to $7,524,122, according to the company's annual report for the year ended Dec. 31, 1930.

Cash dividends paid by the company during the year totaled $7,236,423.75, and a balance of $324,302.57 was transferred to the surplus account, bringing this fund up to $40,782,023.78. In addition the company expended $1,300,000 for improved machinery and equipment for bearing plants and steel mills.

Net profits for 1930 were equal to $3.11 a share on 2,411,842 shares of no par common stock. This compares with a net profit of $14,155,414, or $5.58 a share on 2,407,824 shares of no par common in 1929.

E. C. Bullard Promoted

Edward C. Bullard, vice-president and director of the Bullard Co., Bridgeport, Conn., has been appointed general manager, to succeed his uncle.

Overseas Club Plans New Code

Export Ethics to Be Increased at Meeting

NEW YORK, March 31—Overseas Automotive Club will hold its next monthly meeting April 9 at 12.15 p.m. at its new meeting place, Hotel Governor Clinton, Seventh Avenue and Thirty-first Street. There will be a speaker on the export outlook and the members will be called upon to discuss and approve a proposed code of ethics for the export trade.

There will also be a discussion and probable action on the 1931 overseas merchandising campaign to be sponsored by the club. This campaign will be a continuation of the one conducted last year, during which the importance of the replacement and equipment market abroad during a period when old cars were kept running instead of being replaced by new ones was emphasized.

It is expected that between 7000 and 8000 copies of campaign literature will be prepared in English and Spanish and that the club itself will distribute about 1500 pieces of this literature to wholesalers in various overseas markets. The club is also staging a comprehensive membership drive in the hope of including more exporters on the roster.

Would Restrict Truckways

NEW YORK, March 31—Legislation pending in a number of states to regulate trucks and truck-trailer combinations would, in almost all cases, eliminate the present units used for truckway shipments of automobiles. Indiana already has passed a law limiting the length of such combinations to 40 feet, and a number of other states have bills pending limiting the length to anywhere from 28 to 45 feet. Some of the weight-limit bills are also directed toward this highway unit, but most of these place the weight at such a figure that it would not materially affect the truckaway units which are now in operation.

Traffic Managers to Meet

NEW YORK, March 31—The Traffic Managers Group of the National Automobile Chamber of Commerce will meet on April 8 in Detroit. The special committee which cooperated with the railroads in securing reduced freight rates in the official territory will report at this meeting.

Other business to be discussed at this meeting will include a proposal for lengthening freight cars for greater convenience in floor loading, transcontinental freight rates, rates for mixed carloads, including finished cars and accessories and parts, and rates on cotton piece goods for body building.

Exports, Imports and Reimports of the Automotive Industry For February and Two Months Ended February, 1931-30

	Month of February				Two Months Ended February			
	1931		1930		1931		1930	
	Number	Value	Number	Value	Number	Value	Number	Value
Automobiles, parts and accessories	..	$16,071,378	..	$30,784,631	..	$30,426,133	..	$59,882,493
*Electric trucks and passenger cars	..	..	..	..	..	..	7	12,627
Motor trucks and buses except electric (total)	4,187	2,468,655	6,750	4,677,569	8,721	4,836,101	19,626	12,294,655
**Under 1 ton	833	326,100	3,235	1,787,654	1,407	522,353	12,091	5,779,464
**1 and up to 1½ tons	2,720	1,347,579	3,168	2,195,846	5,566	2,661,556	6,919	5,190,176
**Over 1½ tons to 2½ tons	399	368,549	347	694,069	1,362	1,002,222	616	1,325,015
**Over 2½ tons	203	413,385	..	..	306	610,999	..	..
PASSENGER CARS								
Passenger cars except electric (total)	9,187	5,820,322	18,732	13,071,641	17,493	10,704,238	34,025	24,145,284
Low price range $850, inclusive	7,160	3,471,857	13,383	6,766,142	13,747	6,396,951	24,193	12,334,159
**Medium price range over $850 to $1,200	1,317	1,291,948			2,342	2,264,604		
**$1,200 to $2,000	325	475,650	4,765	4,964,195	572	854,183	8,659	9,065,951
**Over $2,000	206	508,490	584	1,341,304	413	1,005,101	1,173	2,745,174
PARTS, ETC.								
Parts, except engines and tires	..	..	..	..	..	..	..	..
Automobile unit assemblies	..	4,984,234	..	7,942,876	..	9,039,885	..	12,961,792
Automobile parts for replacement (n.e.s.)	..	2,254,417	..	3,578,475	..	4,819,790	..	8,119,622
Automobile accessories	..	306,878	..	546,264	..	611,771	..	1,086,891
Automobile service appliances (n.e.s.)	..	337,252	..	481,329	..	5,824,445	..	1,241,347
Trailers	28	22,418	69	38,840	66	43,305	130	116,666
Airplanes, seaplanes and other aircraft	7	68,768	14	195,750	19	271,621	31	469,939
Parts of airplanes, except engines and tires	..	154,205	..	141,434	..	360,052	..	339,752
BICYCLES, ETC.								
Bicycles	236	6,299	140	3,683	437	11,663	560	16,332
Motorcycles	471	113,115	1,415	338,262	799	192,418	2,736	643,646
Parts and accessories, except tires	..	59,261	..	120,218	..	101,907	..	230,681
INTERNAL COMBUSTION ENGINES Stationary and Portable								
Diesel and Semi-Diesel	21	29,005	27	49,589	54	49,705	61	161,588
Other stationary and portable:								
Not over 10 hp.	800	67,941	2,191	173,391	1,658	132,594	5,103	398,937
Over 10 hp.	238	137,213	115	94,052	454	279,879	503	295,460
Automobile engines for:								
Motor trucks and buses	578	74,502	3,744	290,918	1,219	159,928	3,909	334,005
Passenger cars	2,031	162,370	7,588	676,888	3,068	254,420	10,080	927,617
Tractors	..	..	63	32,805	2	1,007	71	35,545
Aircraft	15	74,676	12	50,713	30	186,803	37	151,461
Accessories and parts (carburetors)	..	203,219	..	381,728	..	383,785	..	696,032
IMPORTS								
Automobiles and chassis (dutiable)	34	36,805	40	53,833	74	52,729	77	103,312
Other vehicles and parts for them (dutiable)	..	3,234	..	17,654	..	6,041	..	39,420
REIMPORTS								
Automobiles (free from duty)	12	10,120	19	30,548	33	44,707	37	43,666

*Not shown separately after 1930.
**Classification changed beginning January, 1931.

Gillette Expects Increase

EAU CLAIRE, WIS., March 30—The Gillette Rubber Co. expects to be running at capacity by April 1 for the first time in more than a year. The plant is working three 8-hour shifts with about 1100 men, exclusive of the office force. The capacity payroll is about 1350. The machine shop is taxed to capacity on orders for molds and other specialties which it supplies to other tire plants as well as its own.

Milwaukee Ford Steps Up

MILWAUKEE, March 30—The Milwaukee Ford assembly plant goes back to full production of five days a week and eight hours a day on April 1, for the first time since Aug. 1, 1930. One hundred men are being recalled, increasing the payroll to 875. April production is scheduled at 2600 units, or nearly twice March output.

Russia Dumping Gasoline

WASHINGTON, March 30—A Soviet shipment of 20,000 cases of gasoline and 10,000 of kerosene has been received at Sao Paulo, Brazil, consigned from Batum to a person who is so far unknown in trade circles, according to Brazilian advices received in the Department of Commerce. A rumor is current that this Russian petroleum will be sold at a reduction of about 30 per cent from the present prices, the Brazilian report states. It is also reported that another shipment of double the amount is en route.

Sterling Increases Payroll

MILWAUKEE, March 30—Increased orders have enabled the Sterling Motor Truck Co. to add 25 men to its payroll during the past week, increasing the number to more than 200. According to Carl G. Hayssen, secretary and general manager, this force probably will be sufficient to handle April production, since a full working week of 50 hours will be instituted April 1.

Auburn Lists More Stock

NEW YORK, March 30—Auburn Automobile Co. has secured additional listing on New York stock exchange of 3839 shares of stock to cover stock dividend payable April 1. Dividend is 2 per cent payable to holders of record March 29.

Ford Motor, Ltd., Declares

NEW YORK, March 30—Ford Motor Co., Ltd., has declared deferred dividend of 36 3/5 cents on American shares, payable March 27 to holders of record March 17.

Wisconsin Increases Tax

MILWAUKEE, March 30—The Wisconsin legislature has passed a bill increasing the gasoline tax from 2 cents to 4 cents per gallon, effective April 1. At the same time it has repealed the personal property tax on motor cars to compensate for the higher fuel levy. The main object of the higher tax is to raise funds to more adequately derive Federal highway aid.

Will Increase Advertising

HAGERSTOWN, IND., March 30—Directors of the Perfect Circle Co. have voted to increase the company's advertising appropriation for the remainder of the year 10 per cent, according to George W. Stout, advertising manager. Both consumer and trade media will be used, according to the announcement.

Borg-Warner Reelects

CHICAGO, March 30—All the directors of the Borg-Warner Corp., were reelected at the annual stockholders' meeting last Wednesday morning and following this, all the officers were reelected at a directors' meeting which took place in the afternoon of the same day.

Final Registration Figures for 1930 Show 0.08 Per Cent Increase in Truck Totals

WASHINGTON, April 4—Registrations of passenger motor vehicles for 1930 showed a decrease from the 1929 figures, but motor truck registrations increased enough to make a slight gain of 0.08 per cent in total motor vehicle registrations for the year, according to reports of the 48 states and the District of Columbia to the Bureau of Public Roads, U. S. Department of Agriculture.

Registered automobiles, taxis and buses numbered 23,042,840 for the year, a decrease of 78,749 vehicles from the 1929 figures of 23,121,589; the registration of 3,480,939 motor trucks and road tractors showed a gain of 101,085 over the 1929 figures. The total registrations of passenger vehicles and of motor trucks for the year amounted to 26,523,779, as against 26,501,443 in 1929.

The states and the District of Columbia collected in registration fees, licenses and miscellaneous taxes in 1930 a total of $355,704,860, which is $7,861,317 more than they collected in 1929.

In addition to passenger vehicle and motor truck registrations, 41 states reported a registration of 262,507 trailers, which is a gain of 69,463, or more than 36 per cent over the 1929 figures. This gain in trailers is the largest made in any one year, as compared with a previous year since the bureau began to compile detailed registrations in 1921. The motorcycle registrations of the 48 states and the District for the year amounted to 107,811, a decrease of 7034 from the previous year's figures.

An Eastern and a Western State, New York and California, each report more than two million passenger vehicles and motor trucks registered in 1930. Each of five states, Illinois, Michigan, Ohio, Pennsylvania and Texas, report more than one million registered.

State	Passenger cars, taxis, and buses 1930	Motor trucks and road tractors 1930	Increase over or decrease (—) from 1929	Per cent of increase or decrease	Total gross receipts for 1930
Alabama	239,170	37,976	— 8,387	—2.9	$ 3,799,761
Arizona	98,480	12,045	1,512	1.4	734,626
Arkansas	193,218	26,986	—12,924	—5.5	4,283,959
California	1,810,969	230,387	67,015	3.4	9,858,810
Colorado	276,847	31,662	5,020	1.7	1,901,230
Connecticut	279,830	51,196	2,963	0.9	8,290,404
Delaware	45,533	10,576	1,149	2.1	1,110,047
Florida	274,705	53,096	—18,176	—5.2	4,813,495
Georgia	294,461	47,119	—17,325	—4.8	4,482,257
Idaho	104,526	14,551	1,003	0.8	1,998,290
Illinois	1,430,676	297,584	23,172	1.4	18,444,247
Indiana	747,366	128,397	9,048	1.0	6,346,879
Iowa	706,196	72,190	— 6,064	—0.8	12,693,621
Kansas	511,384	83,139	13,300	2.3	6,084,348
Kentucky	295,161	35,841	— 1,846	—0.6	5,547,069
Louisiana	230,586	44,697	— 5,585	—2.0	4,609,042
Maine	148,722	37,435	1,651	0.9	3,166,642
Maryland	283,870	37,832	1,829	0.6	3,437,796
Massachusetts	743,288	102,918	28,502	3.5	7,120,583
Michigan	1,161,051	167,158	—66,893	—4.8	22,482,412
Minnesota	624,902	108,070	2,573	0.4	11,062,150
Mississippi	203,443	33,651	—12,917	—5.2	3,046,393
Missouri	670,145	91,455	4,920	0.6	10,150,000
Montana	109,549	25,619	— 5,219	—3.7	1,583,276
Nebraska	367,587	58,642	8,003	1.9	3,804,950
Nevada	23,388	6,257	— 2,270	—7.1	373,966
New Hampshire	93,155	19,028	3,303	3.0	2,290,435
New Jersey	719,695	133,154	20,518	2.5	15,382,456
New Mexico	70,450	13,700	5,776	7.4	1,279,623
New York	1,966,981	340,749	44,471	2.0	40,857,715
North Carolina	397,133	56,108	—30,361	—6.3	6,835,743
North Dakota	155,383	27,636	— 5,027	—2.7	1,958,662
Ohio	1,555,093	204,270	— 7,251	—0.4	13,287,352
Oklahoma	490,947	59,384	—20,460	—3.6	6,536,361
Oregon	234,766	17,357	—16,884	—6.3	9,617,930
Pennsylvania	1,534,834	218,687	20,238	1.2	33,112,371
Rhode Island	116,792	19,631	2,414	1.8	2,280,849
South Carolina	192,141	26,261	—12,872	—5.6	2,878,352
South Dakota	180,195	24,977	973	0.5	2,959,913
Tennessee	330,436	37,823	5,828	1.6	4,767,239
Texas	1,159,139	206,757	17,789	1.3	13,961,362
Utah	96,128	17,869	1,336	1.2	855,584
Vermont	78,398	8,226	— 6,406	—6.9	2,392,152
Virginia	318,582	57,307	—11,316	—2.9	6,493,989
Washington	382,874	63,188	3,721	0.8	7,616,676
West Virginia	225,900	40,373	— 2,615	—1.0	4,702,812
Wisconsin	677,452	105,110	—10,940	—1.4	13,083,521
Wyoming	51,579	9,922	821	1.4	691,509
District of Columbia	139,733	16,943	5,226	3.4	636,001
Total	23,042,840	3,480,939	22,336	0.08	$355,704,860

Independent Tool Has Loss

CHICAGO, March 30 — Independent Pneumatic Tool Co. reports a sharp drop in earnings to less than dividend requirements for 1930. when a net of $558,693 after all charges equaled $3.13 a share on 187,849 no par shares outstanding. In the previous year the company reported $1,331,866, or $7.40 a share, on 180,000 shares of stock. The company's balance sheet Dec. 31, 1930, showed $1,332,833 in government securities held, $308,450 in cash and total current assets of $3,253,998. In comparison, total liabilities were $325,630.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, April 1—Buying for the Easter holidays and the warmer weather last week helped retail trade. The winter and spring wheat belts have been benefited of late by rains and snows. There were no important developments in the industries last week, and textiles continued to make the best showing.

DEPARTMENT STORE SALES

According to the Federal Reserve Bank of New York, department store sales in that district during February were 6 per cent below those a year ago. Sales of wholesale firms declined 24 per cent, and chain store sales were 4 per cent smaller.

RETAIL FOOD PRICES

Retail food prices on February 15, according to the Bureau of Labor Statistics, were 4.33 per cent below those a month earlier, and 17 per cent below those a year earlier.

LIFE INSURANCE SALES

Sales of ordinary life insurance during February were 19 per cent below those a year ago. However, sales of life insurance during February, 1930, were the highest on record for that month.

CONSTRUCTION AWARDS

Construction contracts awarded during February in 37 Eastern States, according to the F. W. Dodge Corp., amounted to $235,405,000, as against $317,053,000 during the corresponding period last year.

CAR LOADINGS

Railway freight loadings during the week ended March 14 totaled 734,262 cars, which marks an increase of 10,728 cars above those in the preceding week, but decreases of 147,046 cars below those a year ago, and 224,339 cars below those two years ago.

CRUDE OIL OUTPUT

Average daily crude oil production for the week ended March 21 amounted to 2,268,050 barrels, as against 2,190,550 barrels for the preceding week and 2,535,900 barrels for a year ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended March 28 stood at 75.6, as against 76.0 the week before, and 76.0 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended March 25 were 22 per cent below those a year ago.

STOCK MARKET

The stock market last week suffered a downward reaction. The decline in the price of wheat resulting from the Federal Farm Board's announcement that it would not purchase additional supplies of wheat after the last of the deliveries of the 1930 crop in May had a depressing effect on security prices. There were also some other reports that had an unfavorable influence on the stock market. Most issues showed substantial net losses for the week.

BROKERS' LOANS

Brokers' loans in New York City during the week ended March 25 decreased $5,000,000, bringing the total down to $1,908,000,000, which is about one-half of the level a year ago.

RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended March 25 showed an increase of $3,000,000 in holdings of discounted bills, while there were decreases of $40,000,000 in holdings of bills bought in the open market, and of $20,000,000 in holdings of government securities. The reserve ratio on March 25 was 85.4 per cent, as against 84.3 per cent a week earlier and 83.3 per cent two weeks earlier.

Car Retirements Placed At 2,896,400 for Year

Automobile Trade Journal Figures Them By Makes

PHILADELPHIA, March 31 — The number of passenger cars retired from active service during the period from July 1, 1929, to July 1, 1930, is estimated by the *Automobile Trade Journal* at 2,896,400, according to a compilation appearing in the April issue.

The basis of calculation was as follows: Total registrations of each make on July 1, 1929, plus registrations of new cars of that make between July 1, 1929, and June 30, 1930, less total registrations on July 1, 1930. These figures by makes, which appear below, are not intended to represent the extent of the official junking operations on the part of several companies represented, although there is no doubt that the total figure is affected by the junking plan.

Estimate of Cars Retired from Service by Makes

	As Calculated	Round Figures
Auburn	4,353	4,400
Buick (Marquette)	140,947	141,000
Cadillac (LaSalle)	22,770	23,000
Chevrolet	316,598	317,000
Chrysler (Maxwell-Plymouth)	58,744	59,000
Dodge	156,512	157,000
Durant (Star-Flint)	82,745	83,000
Essex	85,436	85,000
Ford	1,374,700	1,375,000
Franklin	10,224	10,000
Graham (Paige-Jewett)	31,291	31,000
Hudson	49,946	50,000
Hupmobile	29,018	29,000
Lincoln	2,990	3,000
Nash (Ajax)	51,575	52,000
Oakland	30,272	30,000
Oldsmobile (Viking)	29,085	29,000
Packard	11,144	11,000
Peerless	5,223	5,200
Pierce-Arrow	2,914	2,900
Pontiac	6,908	6,900
Reo	14,399	14,000
Studebaker (Erskine)	101,128	101,000
Stutz	2,021	2,000
Willys (Overland-Whippet)	122,183	122,000
Willys-Knight	15,441	15,000
Misc. (all others)	137,712	138,000
Total	2,896,279	2,896,400

Boat Show Books 100 Exhibits

CHICAGO, March 30—H. H. Erickson, manager, Chicago Motor Boat Show, announces that more than 100 different types of craft will be displayed when the exhibit opens on Navy Pier, April 24. More than 100,000 ft. of floor space will be occupied by the show.

Car Shipments Estimated

WASHINGTON, April 2—Shipments of automobiles, trucks and parts are estimated by the Shippers' Regional Advisory Boards at 177,388 carloads, a decrease of 14.8 per cent under the 208,299 carloads shipped in the second quarter of last year.

Tax Revenue Increases

NEW YORK, March 30—Gasoline tax collections during 1930 reached the high level of $522,110,961, an increase of $73,927,712 over the 1929 level, according to the American Petroleum Institute.

January Gasoline Consumption Shows Increase of 11.5 Per Cent, A. P. I. Reports

NEW YORK, March 30—Gasoline consumption in forty-six states and the District of Columbia for the month of January, 1931, as indicated by reports made by wholesalers and dealers in the various states under provisions of the gasoline tax laws or gasoline inspection laws, totaled 824,810,000 gal., compared with 739,587,000 gal. in January, 1930, an increase of 85,223,000 gal., or 11.50 per cent, according to the American Petroleum Institute. Daily average consumption for January, 1931, was 26,607,000 gal., compared with a daily average of 28,858,000 gal. in December, 1930, a decrease in daily average during January of 7.8 per cent.

The figures giving the quantity of gasoline sold or offered for sale, as reported under the various laws, follow:

GASOLINE CONSUMPTION BY STATES, JANUARY, 1931

	Tax Per Gallon Cents	MONTH OF Jan., 1930 Gallons	Jan., 1931 Gallons	Dec., 1930 Gallons
Alabama	4	13,390,000	12,575,000	13,221,000
Arizona	4	6,497,000	5,850,000	5,935,000
Arkansas	5	10,686,000	11,752,000	10,921,000
Colorado	4	10,488,000	12,037,000	9,963,000
Connecticut	2	17,061,000	13,641,000	12,816,000
Delaware	3	2,816,000	2,258,000	2,406,000
District of Columbia	2	6,443,000	6,489,000	5,452,000
Florida	6	21,213,000	22,221,000	22,012,000
Georgia	6	18,234,000	17,093,000	17,433,000
Idaho	5	3,578,000	2,943,000	2,577,000
Illinois	3	72,692,000	65,609,000	57,714,000
Indiana	4	31,880,000	31,976,000	29,603,000
Iowa	3	33,600,000	27,814,000	24,381,000
Kansas	3	26,153,000	26,815,000	21,722,000
Kentucky	5	12,893,000	12,396,000	10,048,000
Louisiana	5	14,527,000	13,847,000	14,124,000
Maine	4	6,985,000	4,441,000	3,523,000
Maryland	4	14,057,000	12,337,000	10,809,000
Massachusetts	2	41,998,000	33,001,000	30,315,000
Michigan	3	57,316,000	52,644,000	47,036,000
Minnesota	3	25,584,000	28,269,000	22,131,000
Mississippi	5	9,491,000	(a)10,060,000	10,596,000
Missouri	2	35,750,000	34,011,000	27,734,000
Montana	5	4,707,000	4,159,000	3,054,000
Nebraska	4	16,370,000	17,695,000	15,545,000
Nevada	4	1,335,000	1,070,000	929,000
New Hampshire	4	4,010,000	2,959,000	2,627,000
New Jersey	3	40,942,000	36,813,000	32,638,000
New Mexico	5	4,414,000	3,594,000	3,407,000
North Carolina	5	22,053,000	20,045,000	21,240,000
North Dakota	3	4,096,000	6,298,000	3,047,000
Ohio	4	70,193,000	63,371,000	62,115,000
Oklahoma	4	23,050,000	23,448,000	20,154,000
Oregon	4	11,913,000	10,290,000	7,077,000
Rhode Island	2	6,870,000	5,988,000	5,081,000
South Carolina	6	9,785,000	8,987,000	8,803,000
South Dakota	4	8,129,000	8,906,000	7,662,000
Tennessee	5	16,936,000	15,036,000	14,047,000
Texas	4	70,232,000	61,059,000	54,225,000
Utah	3½	3,792,000	3,750,000	3,706,000
Vermont	4	2,966,000	2,124,000	1,793,000
Virginia	5	18,056,000	15,658,000	14,374,000
Washington	3	19,963,000	16,431,000	14,336,000
West Virginia	4	9,953,000	8,028,000	7,125,000
Wisconsin	2	29,046,000	26,879,000	22,444,000
Wyoming	4	2,443,000	2,143,000	1,686,000
Total		894,586,000	824,810,000	739,587,000
Daily Average		28,858,000	26,607,000	23,858,000
Increase over previous year:				
Amount of Increase		.....	85,223,000	.....
Percentage increase in Daily Average		.....	11.50%	.....

(a)—Estimated.

Australia Changes Rule

WASHINGTON, April 2—For customs purposes, all foreign invoice import valuations hereafter will be based by Australia on the rate of exchange existing between the country of exportation and the United Kingdom, which means that the rate of exchange between the exporting country and Australia will be largely disregarded, according to a radiogram from Trade Commissioner Earl C. Squire, Sydney. This arrangement, the message says, is probably temporary, with the possibility that the Australian customs act will be revised so that the rate of exchange between Australia and foreign countries may be taken into consideration when the dutiable value of imports is being reckoned and converted.

Douglas Sales Increase

CHICAGO, March 30 — A sharp increase in sales has been reported by Douglas Aircraft Co. for the quarter ended Feb. 28, 1931. The total was $1,261,606, against $773,440 for the like period of the preceding year. Unfilled orders also increased, totaling $2,958,127 on March 1 against $2,341,338, Nov. 30 last.

Total Marine Exports Drop 40 Per Cent

Boat Shipments Keep Well Up

WASHINGTON, March 31—During the year 1930 the United States exported motor boats, marine engines and equipment valued at $3,048,350, 40 per cent less than in 1929, and 20 per cent less than 1928, according to the Automotive Division, Bureau of Foreign and Domestic Commerce. Comparing the total value of marine exports in 1930 with the year 1927, when shipments totaled $2,566,883, a gain of 18.7 per cent is found. Shipments of motor boats and other marine products have increased over 200 per cent since the year 1922, when exports totaled $990,119.

In spite of business conditions in 1930, shipments of complete motor boat units were well maintained, showing a decrease of only 11 per cent as compared with 1929. This decline is more than accounted for by decreased exports to the United Kingdom.

Purchases in 1930 again showed the tendency toward smaller and less expensive motor boats; the average value of the boats exported in 1930 was $1,648, while in 1929 it was $2,110.

Shipments of outboard or detachable motors, which are meeting with growing favor in a number of countries, showed a decline of 36 per cent, although they were 10 per cent above 1927 shipments. Exports of marine engines, excluding detachable motors, were 48 per cent lower than in 1929, and 19 per cent below 1928.

Eaton Axle Resumes

MASSILLON, OHIO, March 31—Further indication of improvement in the automotive industry has been announced here by the Eaton Axle & Spring Co., which has just reopened its plants here after weeks of idleness.

Company officials said that the axle division of the company had just closed a contract on a new type of axle amounting to $50,000. This contract covers only a few months' delivery and does not indicate the total volume for this year on this axle.

The bumper division also has closed a contract with a large automobile manufacturer and the cap division has large additional orders on which it is now producing, according to the statement.

Stover Reports Loss

CHICAGO, March 30—Stover Manufacturing & Engine Co. for 1930 shows a net loss of $81,986 after all charges, as compared with net income of $117,219, equal to $1.13 a share on the 54,920 common shares after allowance for preferred dividends in 1929. Operating profits of the company declined to $286,638 during the year from $460,221 in 1929.

Discovers New Pigment

CLEVELAND, March 30—Announcement has been made by the Chemical & Pigment Co., subsidiary of the Glidden Co., of a new type of pigment impervious to weather and light.

+ + CALENDAR + + OF COMING EVENTS

SHOWS

Altoona, Pa., Automobile.....April 15-27
International Garage Exposition, Berlin, Germany .....May 9-Aug. 9

CONVENTIONS

American Chemical Society, Indianapolis, Ind. .....March 30-April 4
Washington Motor Freight Assn., Meeting, Seattle, Wash. ..April 11-13
Aeronautical Chamber of Commerce, Detroit .....April 11-19
S.A.E. Natl. Aeronautic Meeting, Detroit, Mich.....April 15-16
Middle Atlantic Jobbers Convention, Philadelphia, Pa. .....April 20-21
American Welding Society Meeting, New York, N. Y. .....April 22-24
Natl. Battery Mfg. Assn. Convention, Niagara Falls .....April 24-25
Eastern Carolina Exposition, Greenville, N. C. .....April 27-May 1
U. S. Chamber of Commerce, Atlantic City .....April 28-May 1
International Chamber of Commerce, Washington, D. C. .....May 4-9
American Gear Mfg. Assn., Buffalo, New York .....May 7-9
Associated Business Papers, Hot Springs, Va. .....May 11-13
Retail Delivery Assn. Convention, Washington, D. C. .....May 25-28
National Foreign Trade Council, New York .....May 27-29
Fourth National Oil and Gas Power Meeting, A.S.M.E., Madison, Wis., June 15-18
S.A.E. Summer Meeting, White Sulphur Springs .....June 15-19
National Association of Credit Men, Boston, Mass. .....June 22-27
National Association of Taxicab Owners, Chicago, Ill. .....June 29-30
S.A.E. Aeronautic Meeting (in conjunction with Natl. Air Races), Cleveland, Ohio .....Sept. 1-3
American Welding Society, Boston, Mass. .....Sept. 21-25
National Safety Council, Chicago, Ill. .....Oct. 12-16

Curtiss-Wright Has Loss

NEW YORK, March 31.—Curtiss-Wright Corp. reports net loss for the year 1930 of $9,374,944. After deduction of the portion applicable to minority interests, the loss applicable to holders of Curtiss-Wright Corp. is $9,012,919. During the year the company effected a number of economies in operation and organization, including the consolidation of its engine-building activities at the Wright plant in Paterson, and its military-plane operations at Buffalo. The company feels that it has now laid the groundwork for maintaining a substantial position in the aviation industry according to its statement.

Kinner Has 2 New Engines

CHICAGO, April 2—Two improved Kinner airplane engines will go on display for the first time at the Detroit show this month, according to an announcement by Robert Porter, president of the Kinner Airplane & Motor Corp., Ltd. Chief among the improvements in the 1931 engines is the perfection of a simple method whereby the entire valve mechanism assembly, including rocker arms and push rods, is inclosed.

Canada Fixes Values On Imported Gasoline

Rates Expected to Stop Dumping of U. S. Fuel

OTTAWA, ONT., March 30—Values for duty purposes have been fixed by Hon. E. B. Ryckman, Minister of National Revenue, on refined gasoline entering Canada from the United States. In a bulletin issued on Saturday to customs and excise officers values for import purposes were placed on gasoline from various refining areas across the border.

The new regulations come into effect immediately. Figures set in the regulations per wine gallon are: Pennsylvania, New York and district, which includes the Atlantic seaboard, 7.292 cents; Toledo, Detroit, Cleveland and district, 7.905 cents; Chicago and district, 6.805 cents; Minneapolis and district, 7.155 cents; Wood River, St. Louis and district, 6.405 cents; Mid-Continent district, which includes the states of Oklahoma, Kansas, part of Missouri, part of Arkansas and North Texas, 4.655 cents; South Texas, Louisiana and district, 6.205 cents; Wyoming and district, 4.655 cents; Montana and district, 7.655 cents.

The effect of the new regulations is that if gasoline is brought into Canada at lower than these figures, the dumping duty automatically applies. Price cutting in some parts of the United States, which in some quarters has been described as a "gasoline war," is understood to have impelled the Minister of National Revenue to take action to prevent Canadian refiners suffering from unfair competition. By the tariff resolutions passed last September at the special session of Parliament, duty on refined gasoline was set under the general tariff, which applies to the United States, at 2½ cents a gallon.

Cleveland Dealers Elect

CLEVELAND, March 26—At the annual meeting of the Cleveland Automobile Manufacturers and Dealers Association held last week at Hotel Cleveland, G. G. G. Peckham was reelected president. Other officers who were reelected were: W. Pitt Barnes, vice-president; R. J. Schmunk, treasurer, and Herbert Buckman, secretary. P. R. Ward was reelected as an additional director.

DeVaux Names Distributor

DETROIT, March 30—Harper & Harper, Philadelphia, have been appointed De Vaux distributors for eastern Pennsylvania, southern New Jersey and Delaware. G. T. Knight, Motor Co. of Wheeling, have been appointed distributors for 25 counties in West Virginia, 10 in southern Ohio and Green County, Pa.

Buhl Takes Autogiro License

DETROIT, March 30—Buhl Aircraft Co., Marysville, Mich., has taken a license from the Autogiro Co. of America to manufacture a new type of Autogiro. The company has been doing some preliminary work on design but no announcement has been made as to when the ship will be placed in production. It is expected that the Buhl Autogiro will be designed to reach a relatively wide market.